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SECTION 013233
PHOTOGRAPHIC DOCUMENTATION

PART 1 – GENERAL

1.1 SUMMARY

A. Drawings and general provisions of the Contract, including General Conditions apply to this Section.

1.2 PHOTOGRAPHS

A. Contractor shall take photographs showing the progress of the work on the site. Beginning not later than ten (10) days after the date of the Notice to Proceed, and monthly thereafter until the work is accepted by DCAS as being substantially complete, Contractor shall take color photographs of the building and premises during weekday working hours, from a minimum of ten (10) locations at each project floor as discussed with DCAS. Contractor shall provide photographs in an electronic format to DCAS for inclusion in a monthly report. All photographs shall be made with equipment adapted to the conditions existing at the work and they shall show clearly and distinctly at as large a scale as possible all work embraced in the picture.

B. All photographs shall have a minimum of 8-megapixel resolution and be emailed in digital format as JPG or PDF. In either format all photographs shall contain the following information attached to the email if sent electronically:

Name of Building_____
Location of Building _____
Contractor_____
Address_____
Taken by_____ Date_____
Elevation, Detail or Space _____
View taken from_____
Looking toward _____

END OF SECTION 013233

SECTION 017419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Contract Documents apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:
   1. Salvaging nonhazardous demolition and construction waste.
   2. Recycling nonhazardous demolition and construction waste.
   3. Disposing of nonhazardous demolition and construction waste.

B. Related Requirements:
   1. Division 04 Section "Unit Masonry" for disposal requirements for masonry waste.
   2. Division 04 Section "Stone Masonry" for disposal requirements for excess stone and stone waste.
   3. Division 31 Section "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for salvage/recycling at the discretion of DCAS of percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert

construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials but not limited to the following:

1. Demolition Waste: Asphalt paving.
    a) Concrete.
    b) Concrete reinforcing steel.
    c) Brick.
    d) Concrete masonry units.
    e) Wood studs.
    f) Wood joists.
    g) Plywood and oriented strand board.
    h) Wood paneling.
    i) Wood trim.
    j) Structural and miscellaneous steel.
    k) Rough hardware.
    l) Roofing.
    m) Insulation.
    n) Doors and frames.
    o) Door hardware.
    p) Windows.
    q) Glazing.
    r) Metal studs.
    s) Gypsum board.
    t) Acoustical tile and panels.
    u) Carpet.
    v) Carpet pad.
    w) Demountable partitions.
    x) Equipment.
    y) Cabinets.
    z) Plumbing fixtures.
    aa) Piping.
    bb) Supports and hangers.
    cc) Valves.
    dd) Sprinklers.
    ee) Mechanical equipment.
    ff) Refrigerants.
    gg) Electrical conduit.
    hh) Copper wiring.
    ii) Lighting fixtures.
    jj) Lamps.
    kk) Ballasts.
    ll) Electrical devices.
    mm) Switchgear and panelboards.
    nn) Transformers.
2. Construction Waste: Masonry and CMU.
    a) Lumber.
    b) Wood sheet materials.
    c) Wood trim.
    d) Metals.
    e) Roofing.
    f) Insulation.

g) Carpet and pad.
h) Gypsum board.
i) Piping.
j) Electrical conduit.
k) Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
   1) Paper.
   2) Cardboard.
   3) Boxes.
   4) Plastic sheet and film.
   5) Polystyrene packaging.
   6) Wood crates.
   7) Plastic pails.

1.5 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within 7 days of date established for commencement of the Work.

1.6 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Include the following information:
   1. Material category.
   2. Generation points of waste.
   3. Total quantity of waste in tons
   4. Quantity of waste salvaged, both estimated and actual in tons
   5. Quantity of waste recycled, both estimated and actual in tons
   6. Total quantity of waste recovered (salvaged plus recycled) in tons
   7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

C. LEED Submittal: LEED letter template for Credit MR 2, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met. (if Contractor rather than Architect or DCAS is required to sign letter for LEED credits).Qualification Data: For waste management coordinator and refrigerant recovery technician.

D. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.7 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of projects with similar requirements, that employs a LEED-

Accredited Professional, certified by the USGBC, as waste management coordinator. Waste management coordinator may also serve as LEED coordinator. (If used waste management coordination services of an outside waste management firm).

B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

C. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Waste Management Conference: Conduct conference at Project. Review methods and procedures related to waste management including, but not limited to, the following:
1. Review and discuss waste management plan including responsibilities of waste management coordinator.
1. Review requirements for documenting quantities of each type of waste and its disposition.
2. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
3. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
4. Review waste management requirements for each trade.

1.8 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume but use same units of measure throughout waste management plan. (If Project requires selective demolition or building demolition).

B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled,

or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
4. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
5. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Project.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project. (At the discretion of DCAS when Project size and complexity of waste management justifies full-time, on-site waste management coordinator should be present).

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Control for dust and dirt, environmental protection, and noise control.

E. Waste Management in Historic Zones or Areas: Hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, by 12 inches or more.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Sale and Donation: Not permitted on Project site.

C. Salvaged Items for DCAS use: Salvage items for DCAS use and handle as follows:
1. Clean salvaged items.

2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until delivery to DCAS.
4. Transport items to DCAS storage area designated by DCAS.
5. Protect items from damage during transport and storage.

D. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

E. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

F. Plumbing Fixtures: Separate by type and size.

G. Lighting Fixtures: Separate lamps by type and protect from breakage.

H. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Receivers and Processors: Contractor to provide DCAS a list of names and telephone numbers of local recycling receivers and processors of recyclable materials.

C. Recycling Incentives: Revenues, savings, rebates, credits, and other incentives received for recycling waste materials shall accrue to Contractor.

D. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

E. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
   a. Inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from DCAS property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

A. Asphalt Paving: Grind asphalt to maximum 3-inch size. (To be used for general fill)
   1. Crush asphaltic concrete paving and screen to comply with requirements in Division 31 Section "Earth Moving" for use as general fill.

B. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.

C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
   1. Pulverize concrete to maximum 2-1/2-inch size. (be used as satisfactory soil for fill or subbase).

D. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

E. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

F. Metals: Separate metals by type.
   1. Structural Steel: Stack members according to size, type of member, and length.
   2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

G. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.

H. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

I. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

J. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.

K. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
   1. Store clean, dry carpet and pad in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

L. Carpet Tile: Remove debris, trash, and adhesive.
   1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

M. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

N. Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:
1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
a) Comply with requirements in Division 32 Section "Plants." for use of clean sawdust as organic mulch.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.
1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
a) Comply with requirements in Division 32 Section "Plants." for use of clean ground gypsum board as inorganic soil amendment.

3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from DCAS property and legally dispose of them.

END OF SECTION 017419

SECTION 017700
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Contract Documents apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Cleaning & Shampoo existing carpeting.
   2. Cleaning existing windows & accessories, doors, trims, frames, sills, wall & ceiling paneling.
   3. Cleaning existing furniture, cabinets and benches.
   4. Clean, wax and polish existing resilient flooring.
   5. Final cleaning.
   6. Repair of the Work.

1.3 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From DCAS/authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
   1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
   1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
      a) Clean Project site
      b) Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
      c) Sweep, mop and wax resilient flooring and similar hard surfaces including wall base.
      d) Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
      e) Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
      f) Remove labels that are not permanent.
      g) Wipe surfaces of millwork, paneling, benches and similar surfaces including ceilings.
      h) Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
      i) Clean exposed surfaces of diffusers, registers, and grills and radiator enclosures.
      j) Leave Project clean and ready for occupancy.

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations included in contract work before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
   1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
   2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
      a) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
   3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

END OF SECTION 017700

SECTION 024119
DEMOLITION AND REMOVAL OF SELECTED PORTIONS OF BUILIDINGS AND SITE ELEMENTS

PART 1- GENERAL

1.1 SUMMARY

A. Drawings and Contract Documents apply to this Section.

B. Section Includes:
1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

C. Related Requirements:
1. Division 32 Sections “Plants” for temporary protection of existing trees and plants affected by selective demolition.

D. The Contractor shall perform all demolition, removal, patching and repair work as directed by DCAS and specified herein, including, but not limited to all work, even if not specifically mentioned herein or in the Drawings, but necessary and required to complete all alterations and renovations as directed.

E. Regulatory Requirements: Comply with governing City, State and EPA regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled, or to remain the City’s property.

B. Remove and Salvage: Items indicated to be removed and salvaged remain the City’s property. Remove items from existing construction, in a manner to prevent damage, clean and pack or crate items to protect against damage. Identify contents of containers and deliver to DCAS’s designated storage area, and reinstall all items as directed by DCAS, in its sole discretion, at no additional cost to DCAS.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, clean, service, and otherwise prepare for reuse, and reinstall in the same locations or in locations indicated.

D. Existing to Remain: Leave existing items in place that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled. Protect construction indicated to remain against damage and soiling during selective demolition. When authorized in the sole discretion of DCAS, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.3 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, reinstalled or otherwise indicated to remain the City's property, demolished materials shall become the Contractor's property and shall be removed from the site (as soon as possible or at the end of each workday) with further disposition at the Contractor's option and at the Contractor's sole cost and expense.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
   1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.4 PREDEMOLITION CONFERENCE

A. Construction Kickoff Meeting: Conduct meeting at Project site as per requirements of General Conditions Article 14, "Job Meetings," wherein specific issues relevant to demolition are reviewed.
   1. Inspect and discuss condition of construction to be selectively demolished.
   2. Review structural load limitations of existing structure.
   3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
   5. Review areas where existing construction is to remain and requires protection.

1.5 SUBMITTALS

A. Written plans for execution of selective removals work, including:
   1. Proposed dust-control measures.
   2. Proposed noise-control measures.
   3. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property. Indicate proposed locations and construction of barriers.

B. Schedule of Selective Demolition Activities: Indicate the following:
   1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
   2. Interruption of utility services.
   3. Coordination for shutoff, capping, and continuation of utility services.
   4. Use of elevator and stairs.
   5. Detailed sequence of selective demolition and removal work to ensure uninterrupted progress of City's on-site operations.
   6. Coordination of City's continuing occupancy of portions of existing building and of City's partial occupancy of completed Work, phasing of the work.
   7. Locations of temporary partitions and means of egress.
   8. Proposed use and type of scaffold (interior only). Should The Work of this contract require design of the scaffold by a Professional Engineer, the Contractor will engage a Professional Engineer at no additional cost to the City of New York.

C. Inventory of items to be removed and salvaged.

D. Inventory of items to be removed by City.

E. Pre-demolition Photographs or Video: Show existing conditions of adjoining construction including finish surfaces, and of site improvements, that might be misconstrued as damage caused by demolition operations.

F. Pre-demolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations.
Comply with Section 013233 "Photographic Documentation." Submit before Work begins.

G. Landfill records indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

H. Detailed description of scaffold or access method to be used to effect work at various locations.

1.6 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed, salvaged, and stored.

B. Record drawings at Project closeout according to the General Conditions.
1. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.

1.7 QUALITY ASSURANCE

A. Demolition Firm Qualifications: All work shall be performed by skilled workers. The Contractor or Sub-contractor performing the work of this section must have recently completed) selective demolition work similar in scope, material, and extent to that indicated by this section and whose work has resulted in construction with a record of successful in-service performance.

1.8 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
1. Provide not less than 72 hours written notice to DCAS of activities that will affect City’s operations.

B The storage or sale of removed items or materials on-site will not be permitted.

C. The conduct of demolition operations shall be in such a manner as to permit maintenance of full operation of all portions of the building not scheduled for construction activities. Areas disturbed by work hereunder shall be restored to original condition.

D. The Contractor shall maintain unobstructed access to all public corridors, exit ways, stairwells, and elevator lobbies on every floor. Interior scaffold may not obstruct access/ egress in any way.

E. The Contractor is hereby notified that the construction may be phased to allow a portion of the building staff to occupy a portion of the space during all phases of construction.

F. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

G. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work. Hazardous materials will be removed by Owner before start of the Work.
   1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

H. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

PART 2- PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

2.2 REPAIR MATERIALS

A. Use repair materials identical to existing materials.

B. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually fully match existing adjacent surfaces possible.

C. Use materials whose installed performance equal or surpasses that of existing materials.

D. In each case, submit samples/specifications for approval by DCAS prior to use.

PART 3- EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

C. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate, and measure the nature and extent of the conflict. Promptly submit a written report to DCAS.

E. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

F. Survey the condition of the building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective demolition. This assessment may require the services of an engineer with the appropriate disciplinary background. The Contractor shall notify DCAS immediately of any such assessment.

G. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

H. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
   1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by DCAS and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities as acceptable to DCAS and to governing authorities.
   2. Provide not less than 72 hours written notice to DCAS if shutdown of service is required during changeover.

3.3 PREPARATION

A. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from DCAS and authorities having jurisdiction. Provide alternate routes around closed or obstructed, traffic ways if required by governing regulations.

3.4 PROTECTION

A. Conduct demolition operations to prevent injury to people. Ensure safe passage of people around selective demolition area and to and from occupied portions of building.
   1. Erect temporary protection, such as, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
   2. Provide, erect, and maintain barriers, warning signs and other items as required for proper protection of workmen engaged in demolition operations.

B. Conduct demolition operations to prevent to adjacent buildings and facilities to remain.
   1. Protect walls, ceilings, floors, and other existing finish work that are to remain and are exposed during selective demolition operations.
   2. Cover and protect furniture, furnishings, and equipment that have not been removed.
   3. Provide temporary weather protection, during interval between selective demolition of existing

construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

4. Cover the floor with building paper and protective planks, and keep it covered until the demolition work is completed.

C. Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.

1. Construct dustproof partitions of not less than nominal 4-inch (100-mm) studs, 5/8-inch (16-mm) gypsum wallboard with joints taped on occupied side, and 2- inch (13-mm) fire retardant plywood on the demolition side. Construct partition to underside of structure above or to hung ceiling and to provide a sealed enclosure for the dustproof partition,
2. Insulate partition to provide noise protection to occupied areas.
3. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
4. Protect air-handling equipment.
5. Weather-strip openings.

D. Provide and maintain interior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of items and areas to be selectively demolished.

1. Strengthen or add new supports when required during progress of selective demolition.
2. The Contractor shall make such probes as are necessary to ascertain any required protective measures before proceeding with demolition and removal. Give particular attention to bracing requirements to prevent any damage to existing conditions.

E. The Contractor shall protect and be responsible for the existing building, facilities, improvements and for all surfaces and materials that are retained within the area of his operations under this Contract.

F. Remove temporary barricades and protections where hazards no longer exist.

3.5 POLLUTION CONTROLS

A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.

1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

1. Remove debris from elevated portions of building by carts using routes approved by DCAS. Chutes and hoists are not permitted.

C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

D. Provide temporary protection for surfaces within areas of work. Cover floors and portions of walls subject to traffic or impact. Use proper floor and wall protection. Do not attach protection in a manner that will damage or deface surfaces. Be responsible for damage due to lack of protection.

3.6 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Demolition and removals shall be carried out in a workmanlike manner as shown by the Work Order, in an orderly and careful manner without unnecessary noise, dust, and other disturbances to the City's personnel, occupants of the existing building, neighbors, and public. All mechanical, electrical, and related equipment, and utilities, shall be completely removed, unless otherwise shown or authorized to be left in place or abandoned. Demolish partitions and walls in small sections.
   2. Demolition in occupied areas of the existing building shall be done in such manner as will not endanger persons, interfere with normal activities, or damage existing finishes scheduled to remain.
   3. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain. Cutting beyond the required limits (over cutting) or careless removals shall be repaired and restored by the Contractor to the satisfaction of DCAS.
   4. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
   5. Do not use cutting torches, cutting operations shall be executed with handheld grinding or sawing tools. Work area is to be cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify, condition and contents of hidden space before starting to cut operations.
   6. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
   7. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
   8. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.

B. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain, using power-driven masonry saw or hand tools: do not use power-driven impact tools.

C. Break up and remove concrete slabs on grade, unless otherwise shown to remain.

D. Remove non-asbestos resilient floor coverings and adhesive according to recommendations of the Resilient Floor Covering Institute's (RFCI) "Recommended Work Practices for the Removal of Resilient Floor Coverings" and Addendum.

E. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.

F. Demolish and remove door frames by neatly cutting the opening plumb and square within 6 inches of the existing opening (unless noted otherwise).

G. The Contractor shall provide cut-out work in partitions, masonry walls, doors, ceilings, and any other surfaces as called for on the plan or drawing provided during construction work and/ or per instructions of electrical; mechanical installations and other utility services and such.

3.7 INTERIOR SCAFFOLD

A. The Contractor shall provide interior scaffold as needed.

1. Scaffold will meet OSHA-approved safety standards for each type of scaffold.
2. DCAS reserves the right to examine scaffold for appropriateness and inspect prior to and during utilization.
3. Scaffolding more than 50 feet in height must be designed by a professional engineer, and erected, used and maintained in accordance with the engineered design.
4. Types of scaffolds includes Standard Metal Tubular Frame Scaffold ("Rolling Scaffold"), Walk-Through (Masonry) Frame Scaffold, Fold-Up Scaffolds.
5. Scaffold must be erected on surfaces which can adequately support all loads applied by the scaffold.
6. Base plates and screw jacks must be used on all non-mobile scaffolding of a size and capacity as specified by the manufacturer. Combination base plates with screw jacks must not be over-extended.
7. Plumbness: When first tier of scaffold is erected, check for plumbness, and continue doing so as the scaffold is built to ensure maximum structural capability of the system.
8. Bracing: Braces cannot be bent or damaged in any way and be secured at each end and self-locking devices should move freely and fall into space. Bracing in the vertical plane is required on both sides of every frame. Bracing in the horizontal plane should be provided at the joint of every third tier of frames. Horizontal bracing should coincide with the point at which scaffold is tied to the building or structure being worked on.
9. If wheels or castors are used, they must be securely attached to the scaffold and equipped with breaks. Ensure the ground is level and free of obstructions.
10. All parts and fittings must be in place and secure before platform components are placed on a scaffold tier. When proceeding with the next tier, workers should lift platform sections or planks from the previous tier leaving either one platform section or two planks.
11. Dismantling: Dismantling of a scaffold proceeds in reverse order to its erection. Each tier should be completely dismantled, and the material lowered to the ground before dismantling of the next tier begins. If platform sections or planks have been left at each level during erection, it is recommended to however additional platform materials from above to the working deck being dismantled. Do not pull or tug on stuck components during dismantling. Workers should wear a safety harness and lanyard tied off to a secure anchor before attempting to loosen stuck or jammed parts. Do not hammer or pry apart the scaffold components. This may cause damage to the components and/ or affect the structural integrity of the scaffold members.
12. Fall Protection: Provide lifeline secured to a suitable anchor on building and attach a fall arrestor (rope grab) to a full body harness while erecting the scaffolding. Properly secure portable ladders, stand-off vertical ladders, scaffold stairway systems and climbing frames.
13. Ladder Rails: The ladder must be properly erected with rails projecting at least 3.3 feet (1 meter) above the platform level. Where scaffold frames are not equipped with ladder rungs, ladders must be installed as the erection of each tier proceeds. Rest stations should be decked in on scaffold towers at intervals no greater than every 16.5 feet (5 meters). Debris, extension cords and tools should be cleared away from areas around the top and bottom of ladders. Both hands must be free to hold guardrails or ladder rails. Do not carry tools or materials by hand when climbing ladders. Wear a tool belt and pouch and move materials up or down by rope. Three-point contact should be used when climbing ladders, using two hands and one foot or two feet and one hand to maintain contact with the ladder at all times. Always face ladder when

climbing and always keep the body's center of gravity between the ladder rails.

14. Typical Loads and Requirements: Do not overload scaffold platforms. Work platforms shall only be located on the top and bottom of end frames, not across intermediate braces. A standard minimum platform capacity is a uniformly distributed load of 50 lb/sq. ft. for typical construction work. For masonry construction where large pallets of concrete block, etc. to be carried, minimum capacity must be at least a uniformly distributed load of 150 lbs/sq. ft. Scaffolds with spans of 7 feet (2.1 meters) should be at least double-planked. Aluminum/plywood platforms should also have a layer of scaffold planks on top.
15. *Looseness, Cracking and Distortion*: Platform hooks and fastening hardware must be checked regularly for looseness, cracking, and distortion.
16. Planking: Scaffold planks must be examined prior to use on a scaffold and at regular intervals to ensure that the planks remain in safe condition.
    a. The wood plank must be No. 1 construction grade lumber (S-P-F) or better, nominal size 2" x 10" (50 mm x 250 mm). They must be properly seasoned and free from bow, crook, cup or twisted warp.
    b. Splits: Planks with splits wider than 3/8" (10 mm) or lengthwise splits closer than 3" (75 mm) to the edge of the plank must be removed from service. When a lengthwise split in a plank exceeds 1/2 the length of the plank, then that plank should also be removed from service. Plywood cleats should not be used along the length of the plank to deep planks from splitting. Scaffold planks with cleats should be inspected immediately and removed from service if there is any indication of wood rot.
    c. Woodgrain: The grain is not to exceed a slope of 1 in 12 along the length of the plank.
    d. Knots: Knots must be sound, tight and spaced well apart. Maximum knot size for a 2" x l0" (50 mm x 250 mm) plank is 2" (50 mm). Knots on the edge of a plank must not be greater than 3/8" (10 mm) width, or spike across the entire width.
17. Guardrails: Guardrails must be constructed to resist a force of at least 200 lbs. (900 Newtons applied anywhere on the guardrail. If guardrails are composed of sawn lumber, the vertical members, top rail, and mid-rail are to be made of 2" x 4" (50 mm x 100 mm) lumber and the toe board should be 1" x 6" (25 mm x 150 mm). The lumber used should be Number 1 construction grade SPF or better. The vertical wooden posts may be attached to the frame legs using U-c1ips or at least four "wraps" of No. 9 gauge wire with ends adequately twisted and secured. Vertical cross-bracing is not considered to be a guardrail and must not be used in such a manner. Tube-and-clamp guardrails may be constructed from standard aluminum scaffold tubing using parallel clamps to attach the vertical posts to each frame leg. Top rails and midrails should also be attached to the vertical posts.
18. Midrails and Toe boards: A midrail should be provided where necessary, especially if workers are kneeling or bending over with frequency to do the work. The midrail should have the same design capacity as the top rail. Toe boards should be provided where there is a possibility of materials falling from the working level to a site below. The toe board must be a minimum 5" (125 mm) in height.
19. Three-to-One Rule: the ratio of unsupported height to least lateral dimension on a scaffold should not exceed 3 to 1 unless the scaffold is:
    a. Tied hack to the structure at proper horizontal and vertical intervals.
    b. Equipped with outrigger stabilizers to maintain the ratio of 3 to 1.
    c. Equipped with a properly designed anchored guy wire system.

***The 3-to-1 rule applies only to the extent that outriggers are extended symmetrically about the scaffold tower.*

20. Outrigger Stabilizers: Maintain the 3-to-1 ratio. Scaffolds may have outrigger stabilizers which may be attached to the scaffold base. With devices of this type, ensure that the outrigger is

adjusted so that the foot will not be moved by vibration or dynamic loads on the platforms. Where stabilizers are used with castors, the castors must rest firmly on a solid surface with the stabilizer secure din the extended position before workers use the platform. Outriggers must be properly deployed and "snugged up" so that sufficient contact is made with the surface to prevent settlement or movement due to side thrusts.

21. Tie-Back Requirements: Scaffolds which exceed the 3-to-1 rule must be tied into the building or structure at intervals not exceeding 3 times the least lateral dimension of the scaffold. This usually means tie-ins are applied at every third frame vertically and every second frame horizontally for tubular frame scaffolds. Tie-ins for tube-and-clamp scaffolds should be applied at every second node vertically and 'every third standard horizontally. These tie-ins must be capable of sustaining lateral loads in both tension (pull) and compression (push). Anchor ties, reveal ties, box ties, through ties may be used. The system must be capable of supporting significant horizontal live and dead loads. Should open scaffold heights exceed 50 feet (15 meters) or hoarded scaffold exceed 25 feet (7.5 meters), the system must be designed by a Professional Engineer. Wire is not to be used in a tie- back system for securing scaffolding to a building or other structure, where the height of the scaffolding is greater than 50 feet (15 meters).
22. Rolling Scaffolds: Rolling scaffolds, other than those which are lifted off the ground on outriggers, must have brakes on all wheels. All brakes must be applied when the scaffold reaches the desired position, rolling scaffolds must always be used on a surface which is smooth, free of depressions and reasonably level.
23. Castors: Castors must be positively secured to the frame and properly sized according to the manufacturer's specification. Castors or wheels should be suitable for the surface on which the scaffold is to be used.
24. Scaffold Safety:
    a. Rolling scaffolds over one frame in height must not be moved while a worker is on the platform. If for some reason workers must remain on the platform when the scaffold is being moved, they should be tied off to an independent structure with a fall arrest system.
    b. The floor area where the scaffold is to be moved should be free of bumps or depressions and cleared of all debris.
    c. Rolling scaffolds must be securely pinned together and should always be fitted with horizontal bracing as recommended by the manufacturer. Scaffolds which are not securely pinned together can separate if they drop into a hole or depression or run into an obstacle at ground level. Horizontal bracing is necessary on a standard frame scaffold to keep it from folding up because the connections between frames braces are essentially pinned joints.
    d. Structural components that are bent, damaged, or severely rusted should ot be used.
    e. Platforms with damaged hooks should not be used.
    f. Planks showing damage should be discarded and removed from the site so that they cannot be used for platform material.
    g. De-lamination in laminated veneer lumber planks is not acceptable.
    h. Components in scaffold system must work harmoniously.
    i. Scaffolding that has been in place for long periods of time must be inspected and certified as sound by the Contractor's engineer.

3.8 PATCHING AND REPAIRS

A. Promptly patch and repair holes and damaged surfaces caused to adjacent construction by selective demolition operations.

B. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
   1. Completely fill holes and depressions in existing masonry walls to remain with an approved masonry patching material applied according to manufacturer's printed recommendations.
   2. Submit for approval by DCAS all materials utilized for patching and repairs.

D. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.

E. Patch and repair floor and wall surfaces in the new space where demolished walls or partitions extend one finished area into another. Provide a flush and even surface of uniform color and appearance.

E. The Contractor shall promptly repair damage caused to adjacent surfaces by demolition operations at no additional cost to the City.

F. When carpet has padding glued to the floor and/ or underlayment as well, floor shall be cleared of material, scraped, and sanded, flush patched smooth ready for installation of new floor finish.

G. Any disturbances or damage to the existing building and improvements existing surfaces to be retained or any impairment of facilities resulting directly or indirectly from the Contractor's operations, shall be promptly restored, repaired, or replaced to the satisfaction Commissioner at no additional cost to the City.

H. Areas affected by demolition work such as walls, ceiling and/ or floor, etc. shall be retained, patched, and refinished to an excellent condition to match existing surfaces.

I. The Contractor will be responsible for all patching and repair work affected by the demolition to the satisfaction of AM, all patching and repair will be deemed included in the unit price. All over- cutting and careless removals shall be remedied, repaired, and restored to the satisfaction of AM at the Contractor's expense and at no additional cost to the City.

3.9 DISPOSAL/REMOVAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site. Do not burn demolished materials. Transport demolished materials off City's property and legally dispose of them. Accumulation of old materials and/ or debris will not be permitted. All old material shall be removed promptly. The premises and job site shall be left safe, neat and orderly without excess piles of debris or rubbish, at the end of each working day.

B. General: Providing dumpsters and/ or containers of appropriate size for the amount of debris to be removed and securing location for dumping of debris shall be Contractor's responsibility and at no extra cost to the City. The Contractor shall be responsible to obtain all applicable permits from agencies having jurisdiction and shall pay all related fees. The carting company will be responsible for all fines imposed directly or indirectly as associated with these containers. All related costs for the securing of containers, removal of debris from the job site, legally carting and/ or hauling to disposal site and disposal of same is deemed included, at no extra cost to DCAS.

3.10 HALF, 1, 10, 20, and 30 CUBIC YARD CONTAINERS

A. At the sole discretion of DCAS, the Agency can and may require the Contractor to furnish all permits, labor, and containers necessary, required and/ or as directed to cart away any and all debris at a given location citywide not specifically related to the work described herein.

B. Upon verbal notification by DCAS, delivery and pick-up shall be made within twenty-four (24) hours. The Contractor shall furnish roll-off containers of various sizes to various locations citywide. All deliveries and pick-ups shall be made with the utmost care so as not to damage any City or non-City property. The Contractor shall be responsible for any and all repairs associated with damage caused by deliveries and/ or pick-ups.

C. The Contractor shall be responsible to obtain all applicable permits from agencies having jurisdiction and shall pay all related fees. The carting company will be responsible for all fines imposed directly or indirectly associated with these containers.

D. The Cubic Yard Container provision of the contract is independent and exclusive of the responsibilities of the Contractor as outlined in Paragraph 3.7 Disposal/ Removal of Demolished Materials.

3.11 REMOVAL AND SALVAGE

A. Summary: Where “Remove and Salvage” is indicated, it is the intent that all work to be removed and stored will be reinstalled. It is the Contractor’s responsibility to verify that each item listed in this Section which is to be removed and stored appears on the shop drawings. If not otherwise drawn or specified, the item shall be reinstalled to match its original condition in every aspect.

B. Salvage Materials: Removal & salvage shall also include all work to be clearly marked, record of origin, careful removal in a manner to permit reuse, storage and safeguard of all architectural elements and items designated to be reused.

C. Quality Assurance: Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are familiar with: the specified requirements of this Section; restoration of historic buildings; protection of valuable objects; and the methods needed for proper performance of the work of this Section. In acceptance or rejection of work, no allowance will be made for lack of skill on part of workmen.

D. Documentation: Completely document existing conditions on shop drawings showing all items to be removed and stored for reinstallation. Label and number all items with water resistant materials in places that will not be visible in the finished work and indicate numbers on shop drawings in a legible manner. The labels and numbers must remain legible for the duration of the Contract. Submit drawings to DCAS for approval in accordance with the requirements of the General Conditions. No removal is to be started until DCAS has given written approval of the documentation.

1. Document the condition of all work to remain before proceeding with the work of this Section by submitting 8” x 10” photographs to DCAS. DCAS shall make the final determination of existing work to be documented. Removal work will not be permitted, nor will payment be made for it, until such photographs are submitted.

E. Description of Work: Submit a description of removal and storage operations to DCAS for approval prior to beginning work. Do not begin work until DCAS has given written approval. Provide a

detailed sequence of removal and storage work to ensure uninterrupted progress of the work.

1. Description of work shall include details of methods, equipment, materials, temporary enclosure, storage locations, provisions for protection and security, and any other pertinent information about such operations as will enable DCAS to coordinate the designation in the field of elements to remain or to be removed and stored.

F. Job Conditions: Properly protect all material to remain before beginning and during progress of the work. Handle all removed material that is to be saved and reinstalled with great care. Conduct removal and salvage operations and removal of debris to ensure minimal interference with the operation of and access to the building (and with roads. streets. walks and other adjacent occupied or used facilities). Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction. Ensure safe passage of persons around area of removal and storage work. Conduct operations to prevent injury to adjacent buildings, structures, other facilities and persons. Erect temporary covered passageways as required by DCAS.

1. Promptly repair any and all damage caused to adjacent materials or facilities by removal and storage operations to the complete satisfaction of DCAS at no cost to the City.
2. Maintain existing utilities, keep in service and protect against damage during work

G. Protection: During the construction period, the Contractor shall provide adequate protection for existing work to remain. Perform all work including removal of debris in a careful manner so as not to damage any of the remaining building fabric. All existing work to remain shall be kept clean and undamaged.

1. All work shall comply with all safety requirements of the State and City of New York; Standard No. 241 Safeguarding Building Construction and Demolition Operations, latest edition, of the National Fire Protection Association; and OSHA regulations.
2. Prohibit all entry to work area during demolition.

H. Sequence of Work: The Contractor shall be responsible for establishing the sequence of the work and assuring its prompt and faithful execution: Remove all labels (documentation) before reinstallation.

I. Completely repair, restore and/ or replace in kind, to the complete satisfaction of AM, any and all damage or harm caused by the work and/ or operations of the Contractor of this Section, at no additional cost to the City. All such work shall be documented by written description accompanied by a sketch to be approved by DCAS prior to the initiation of any work.

3.12 CLEANING

A. Sweep the building broom clean on completion of selective demolition operation.
B. Change filters on air-handling equipment on completion of selective demolition operations.

3.13 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

END OF SECTION 024119

SECTION 033000
CAST-IN-PLACE CONCRETE INCLUDING REINFORCEMENT

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:
1. Section 035300 "Concrete Topping" for emery- and iron-aggregate concrete floor toppings.
2. Section 312000 "Earth Moving" for drainage fill under slabs-on-grade.
3. Section 321313 "Concrete Paving" for concrete pavement and walks.

1.3 DEFINITIONS

A. Aggregates: the gravel, sand, or recycled and sometimes decorative materials, at specified sizes, that are held by the cured paste in concrete.

B. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

C. Embodied Carbon: The amount of CO2 equivalence (CO2e) in mining, manufacturing/processes, and assembly of a product in what is referred to as “Stage A1-A3” of a Life Cycle Assessment, also known as the up-front embodied carbon emissions.

D. Environmental Product Declaration (EPD): 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.

E. GGP (Ground-Glass Pozzolans): A supplementary cementitious material (SCM) that results from the processing of suitable recycled glass products. Finely ground glass powder mitigates alkali-silica reaction (ASR).

F. High Early Strength Concrete: Concrete that, through the use of additional cement, high-early-strength cement, or admixtures, has accelerated early-age strength development.

G. Local Aggregates: Locally sourced stone at requisite size and characteristics for use in the concrete mix, reducing embodied carbon through reduction in transit weigh and volume.

H. Low Carbon Concrete: Concrete produced with reduced upfront embodied global warming potential (GWP) compared to industry standard concrete with the same compressive strength, achieved by limiting cement content, replacing portions of or all cement with supplementary cementitious materials, and incorporating locally-sourced aggregates, recycled concrete aggregates, or coarse crushed concrete aggregates.

I. PLC (Portland-Limestone Cement): a slightly modified version of Portland cement that reduces embodied carbon; now described in ASTM and AASHTO specifications.

J. Recycled Concrete Aggregates and Coarse Crushed Concrete Aggregates (RCA and CCCA): deconstructed concrete crushed on-site or off, intended for re-use in projects, typically as fill.

K. Supplementary Cementitious Materials (SCM): materials resulting from another manufacturing process or waste stream that may be processed and used to replace portions or all cement in concrete. SCMs chemically react to provide cementitious properties and enhance concrete strength and durability, and include fly ash, slag cement, silica fume, natural pozzolans, or GGP.

L. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference:
   1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
      a) Contractor's superintendent.
      b) Independent testing agency responsible for concrete design mixtures.
      c) Ready-mix concrete manufacturer.
      d) Concrete Subcontractor.
      e) Special concrete finish Subcontractor.
   2. Review special inspection and testing and inspecting procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, concrete repair procedures, and concrete protection as applicable.

1.5 ACTION SUBMITTALS

A. Sustainable Design Submittals:
   1. Effective January 1, 2025, ready-mix concrete, structural steel, and precast concrete supplied to the construction site shall be delivered with an Environmental Product Declaration. Failure to submit an EPD will exclude the material from being used.
      a) Concrete Environmental Product Declarations: product-specific cradle-to-gate Type III EPDs for each concrete mix design specified and used at the project, using NSF International’s product category rule for concrete. The same requirement applies to all cement-based repair materials. Send EPDs with each concrete mix batch design (including type [e.g. standard or lightweight mix] and volume).

b) Steel Environmental Product Declarations: product-specific cradle-to-gate Type III EPDs for all structural steel specified and used at the project.
c) Precast Concrete Environmental Product Declarations: product-specific cradle-to-gate Type III EPDs for all precast concrete products used at the project, using NSF International's product category rule for concrete.

2. Laboratory Test Reports: For indicating compliance with requirements for low-emitting materials.

B. Product Data: For each type of product.

C. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when EPD-Reported global warming potential (GWP), characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments. High early strength concrete should not be produced using additional cement wherever possible, due to its higher embodied carbon.
1. Indicate amounts of mixing water to be withheld for later addition at Project site.

D. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

E. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
1. Location of construction joints is subject to approval of the Engineer.

F. Samples: For materials identified by the Engineer.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, manufacturer, testing agency, etc.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Fiber reinforcement.
6. Waterstops.
7. Curing compounds.
8. Floor and slab treatments.
9. Bonding agents.
10. Adhesives.
11. Vapor retarders.
12. Semirigid joint filler.
13. Joint-filler strips.
14. Repair materials.

D. Material Test Reports: For the following, from a qualified testing agency:
   1. Aggregates:

E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.
   1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.

F. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

G. Field quality-control reports.

H. Minutes of pre-installation conference.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed low-carbon concrete products, able to provide batch EPDs for all concrete mix designs, and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction**,** qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
   1. Personnel conducting field tests shall be qualified as ACI Concrete Field-Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
   2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M.

E. Mockups: Cast concrete slab-on-grade and/or formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.
   1. Build panel approximately 200 sq. ft. (18.6 sq. m) for slab-on-grade and 100 sq. ft. (9.3 sq. m) for formed surface in the location indicated or, if not indicated, as directed by Architect.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.10 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).
   2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and as follows:
   1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
   1. ACI 301 (ACI 301M).
   2. ACI 117 (ACI 117M).

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
   1. Plywood, metal, or other approved panel materials.
   2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
      a) High-density overlay, Class 1 or better.
      b) Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
      c) Structural 1, B-B or better; mill oiled and edge sealed.
      d) B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

3. Overlaid Finnish birch plywood.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.

E. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

F. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

G. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

H. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

I. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
1. Furnish units that leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
2. Furnish ties that, when removed, leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

C. Galvanized Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420) ASTM A 706/A 706M, deformed bars, ASTM A 767/A 767M, zinc coated after fabrication and bending.

D. Epoxy-Coated Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420) ASTM A 706/A 706M, deformed bars, ASTM A 775/A 775M or ASTM A 934/A 934M, epoxy coated, with less than 2 percent damaged coating in each 12-inch (300-mm) bar length.

E. Stainless-Steel Reinforcing Bars: ASTM A 955/A 955M, Grade 60 (Grade 420), Type 304 or Type 316L, deformed as shown on the plans.

F. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60 (Grade 420) ASTM A 706/A 706M, deformed bars, assembled with clips.

G. Plain-Steel Wire: ASTM A 1064/A 1064M, as drawn.

H. Deformed-Steel Wire: ASTM A 1064/A 1064M.

I. Epoxy-Coated Wire: ASTM A 884/A 884M, Class A, Type 1 coated, as-drawn steel wire, with less than 2 percent damaged coating in each 12-inch (300-mm) wire length.

J. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.

K. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

L. Galvanized-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from galvanized-steel wire into flat sheets.

M. Epoxy-Coated Welded-Wire Reinforcement: ASTM A 884/A 884M, Class A coated, Type 1, plain or deformed steel as shown on the plans.

2.4 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.

B. Epoxy-Coated Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, ASTM A 775/A 775M epoxy coated.

C. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775/A 775M.

D. Zinc Repair Material: ASTM A 780/A 780M.

E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
   1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
   2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
   3. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.5 CONCRETE MATERIALS

A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer. Locally sourced aggregate, recycled concrete aggregate, and coarse crushed concrete aggregate should be utilized unless it becomes unduly difficult or financially burdensome to do so.

B. Cementitious Materials:
   1. Portland Cement: ASTM C 150/C 150M, Type and color as shown on the plans.
   2. Fly Ash: ASTM C 618, Class F, Class F or C as shown on the plans.
   3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
   4. Blended Hydraulic Cement: ASTM C 595/C 595M, cement as shown on the plans.

C. Supplementary Cementitious Materials: A 30% minimum by total weight of all cementitious materials should consist of SCMs (including fly ash, slag, silica fume, GGP in alignment with ASTM C1866, and/or metakaolin) unless otherwise shown on the Contract Drawings.

D. Normal-Weight Aggregates: ASTM C 33/C 33M, coarse aggregate or better, graded Type as shown on the plans. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
   1. Maximum Coarse-Aggregate Size: as designed by the Engineer.
   2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

E. Lightweight Aggregate: ASTM C 330/C 330M, nominal maximum aggregate size as designed by the Engineer.

F. Air-Entraining Admixture: ASTM C 260/C 260M.

G. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
   1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
   2. Retarding Admixture: ASTM C 494/C 494M, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
   5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

H. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.

I. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-

accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

J. Color Pigment: ASTM C 979/C 979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
   1. Color: As selected by Architect from manufacturer's full range.

K. Water: ASTM C 94/C 94M and potable.

2.6 FIBER REINFORCEMENT

A. Synthetic Micro-Fiber: Monofilament polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, dimensions long shown on the plans.

B. Synthetic Micro-Fiber: Fibrillated polypropylene micro-fibers engineered and design shown on the plans for use in concrete, complying with ASTM C 1116/C 1116M, Type III, dimensions long shown on the plans.

C. Synthetic Macro-Fiber: Polyolefin macro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1 to 2-1/4 inches (25 to 57 mm) long.

2.7 WATERSTOP

A. Flexible Rubber Waterstops: CE CRD-C 513, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
   1. Profile: As indicated on the plans
   2. Dimensions: As indicated on the plans

B. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstops with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals. Factory fabricate corners, intersections, and directional changes.
   1. Profile: As indicated on the plans
   2. Dimensions: As indicated on the plans

C. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
   1. Profile: As indicated on the plans
   2. Dimensions: As indicated on the plans

D. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch (19 by 25 mm).

E. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer-modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch (10 by 19 mm).

2.8 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A Include manufacturer's recommended adhesive or pressure-sensitive tape.

B. Sheet Vapor Retarder: ASTM E 1745, Class B Include manufacturer's recommended adhesive or pressure-sensitive tape.

C. Sheet Vapor Retarder: ASTM E 1745, Class C Include manufacturer's recommended adhesive or pressure-sensitive joint tape.

D. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils (0.25 mm) thick.

E. Bituminous Vapor Retarder: 110-mil- (2.8-mm-) thick, semiflexible, seven-ply sheet membrane consisting of reinforced core and carrier sheet with fortified asphalt layers, protective weather coating, and removable plastic release liner. Furnish manufacturer's accessories, including bonding asphalt, pointing mastics, and self-adhering joint tape.
   1. Water-Vapor Permeance: 0.0011 grains/h x sq. ft. x inches Hg (0.063 ng/Pa x s x sq. m); ASTM E 154.
   2. Tensile Strength: 140 lbf/inch (24.5 kN/m); ASTM E 154.
   3. Puncture Resistance: 90 lbf (400N); ASTM E 154.

2.9 FLOOR AND SLAB TREATMENTS

A. Slip-Resistive Emery Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive, crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials with 100 percent passing size or gradation sieve as shown on the plans.

B. Slip-Resistive Aluminum Granule Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of not less than 95 percent fused aluminum-oxide granules.

C. Emery Dry-Shake Floor Hardener: Pigmented or Unpigmented as shown on the plans, factory-packaged, dry combination of Portland cement, graded emery aggregate, and plasticizing admixture; with emery aggregate consisting of no less than 60 percent of total aggregate content.
   1. Color: As selected by Architect from manufacturer's full range.

D. Metallic Dry-Shake Floor Hardener: Pigmented or Unpigmented as shown on the plans, factory-packaged, dry combination of Portland cement, graded metallic aggregate, rust inhibitors, and plasticizing admixture; with metallic aggregate consisting of no less than 65 percent of total aggregate content.
   1. Color: As selected by Architect from manufacturer's full range.

E. Unpigmented Mineral Dry-Shake Floor Hardener: Factory-packaged dry combination of Portland cement, graded quartz aggregate, and plasticizing admixture.

F. Pigmented Mineral Dry-Shake Floor Hardener: Factory-packaged, dry combination of Portland cement, graded quartz aggregate, color pigments, and plasticizing admixture. Use color pigments that are finely ground, nonfading mineral oxides interground with cement.
   1. Color: As selected by Architect from manufacturer's full range.

2.10 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

2.11 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, non-dissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

G. Verify with manufacturer that retained products have been tested against interference with bonding of floor covering.

H. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

I. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

J. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.12 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork as designed by the Engineer.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, as shown on the plans according to ASTM D 2240.

C. Bonding agent in “Bonding Agent” Paragraph below may be used directly from container or as an admixture in cement or sand-cement slurries and rubbing grout.Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
   1. Types, and nonload bearing or load bearing as shown on the plans, for bonding hardened or freshly mixed concrete to hardened concrete.

E. Reglets: Fabricate reglets of not less than 0.022-inch- (0.55-mm-) thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

F. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.13 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
   1. Cement Binder: ASTM C 150/C 150M, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
   2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
   4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6.4 mm) and that can be filled in over a scarified surface to match adjacent floor elevations.
   1. Cement Binder: ASTM C 150/C 150M, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
   2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
   4. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.14 CONCRETE MIXTURES, GENERAL

A. In order to comply with NYC Executive Order 23, all batch-plant ready-mixed concrete must adhere to one of the following criteria:
   1. All concrete mixes shall adhere to the requirements specified in Table 1.
   2. Total supplementary cementitious material content (SCM_{proj}) shall be based on total supplementary cementitious materials of all concrete mix designs within the same project. Total SCM for a project shall be no less than the value calculated according to Equation 2.14.1.

      Equation 2.14.1:

      $SCM_{proj} > SCM_{min}$

where

$SCM_{proj} = \Sigma SCM_n\ V_n$ and $SCM_{min} = \Sigma SCM_{lim}\ V_n$

and

n = the total number of concrete mixtures for the project

SCM_n = the SCM content for mixture n , lb/cu yd.

SCM_{lim} = the minimum SCM content for mixture n per Table 1, lb/yd 3

V_n = the volume of mixture n concrete to be placed, yd^3

3. Total global warming potential (GWP_{proj}) of all concrete mix designs within the same project shall not exceed the project limit ($GWP_{allowed}$) determined using Table 1 and Equation 2.14.2.

Equation 2.14.2:

$GWP_{proj} < GWP_{allowed}$

where

$GWP_{proj} = \Sigma GWP_n\ V_n$ and $GWP_{allowed} = \Sigma GWP_{lim}\ V_n$

and

n = the total number of concrete mixtures for the project

GWP_n = the global warming potential for mixture n per mixture EPD, kg/m^3

GWP_{lim}= the global warming potential limit for mixture n per Table 1, kg/m^3

V_n = the volume of mixture n concrete to be placed, m^3

PART 3 - TABLE 1 - CONCRETE MIX REQUIREMENTS									
Class of Concrete	Coarse Aggregate Sizes (ASTM C 33)			Minimum Supplementary Cementitious Materials (SCM) (lbs/cu yd.)	Cement Type (ASTM C 150)	W/(C + P) Max.	Specified Strength (psi)		Global Warming Potential Limit (GWP) (kg $CO2e/m^3$)
	A	B	C				f_c minimum field condition	f_{cr} minimum for mix design See FN3	
50	#67 (3/4" to No. 4)	#8	-	550	III	0.42	5,000 at 28 days	6,200 at 28 days	305
45	#57 (1" to No. 4)	#8	-	525	II	0.42	4,500 at 28 days	5,850 at 28 days	284
45F	#4 (1.5" to 3/4")	#67	#8	525	II	0.41	4,500 at 56 days	5,850 at 56 days	284
40LW	3/4" to No. 4	-	-	525	I or II	0.45	4,000 at 28 days	5,200 at 28 days	284

45PG	3/8" to No. 16	#8	-	660	II	0.40	4,500 at 28 days	5,850 at 28 days	284
25	#57 to #67	-	-	376	II	0.60	2,500 at 28 days	3,500 at 28 days	228

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

Footnotes (FN) to Table 1:
FN1. Minimum 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.

B. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 (ACI 301M).
   1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

C. Cementitious Materials: As shown on the plans

D. Percentages in six subparagraphs below repeat ACI 301 (ACI 301M) limits for concrete exposed to deicing chemicals. Revise to suit Project.
   1. Fly Ash: 25 percent.

E. Limit water-soluble, chloride-ion content in hardened concrete to percent by weight of cement shown on the plans.

F. Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete as shown on the plans, or as required, for placement and workability.
   2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
   3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.
   4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

G. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.15 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Normal-weight concrete.
   1. Minimum Compressive Strength: 4000 PSI
   2. Maximum W/C Ratio: As shown on the plans.
   3. Slump Limit: As shown on the plans
   2. Air Content: As shown on the plans

B. Foundation Walls: Normal-weight concrete.
   1. Minimum Compressive Strength: 4000 PSI

2. Maximum W/C Ratio: As shown on the plans.
3. Slump Limit: As shown on the plans.
4. Air Content: As shown on the plans.

C. Slabs-on-Grade: Normal-weight concrete.
1. Minimum Compressive Strength: 5000 PSI.
2. Maximum W/C Ratio: As shown on the plans.
3. Minimum Cementitious Materials Content: As shown on the plans.
4. Slump Limit: As shown on the plans.
5. Air Content: As shown on the plans.
6. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
7. Steel-Fiber Reinforcement: Add to concrete mixture, according to manufacturer's written instructions, as shown on the plans.
8. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, as shown on the plans.
9. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate as shown on the plans.

D. Suspended Slabs: Normal-weight concrete.
1. Minimum Compressive Strength: 6000 PSI.
2. Maximum W/C Ratio: as shown on the plans.
3. Minimum Cementitious Materials Content: as shown on the plans.
4. Slump Limit: as shown on the plans.
5. Air Content: as shown on the plans.
6. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
7. Steel-Fiber Reinforcement: Add to concrete mixture, according to manufacturer's written instructions, as shown on the plans.
8. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, as shown on the plans.
9. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, as shown on the plans.

E. Suspended Slabs: Lightweight concrete.
1. Minimum Compressive Strength: 5000 PSI.
2. Calculated Equilibrium Unit Weight: as shown on the plans.
3. Slump Limit: as shown on the plans.
4. Air Content: as shown on the plans.
5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
6. Steel-Fiber Reinforcement: Add to concrete mixture, according to manufacturer's written instructions, as shown on the plans.
7. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, as shown on the plans.
8. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, as shown on the plans.

F. Concrete Toppings: Normal-weight concrete.
1. Minimum Compressive Strength: 4000 PSI.
2. Minimum Cementitious Materials Content: as shown on the plans.
3. Slump Limit: as shown on the plans.
4. Air Content: as shown on the plans.
5. Air Content: Do not allow air content of trowel-finished toppings to exceed 3 percent.

6. Steel-Fiber Reinforcement: Add to concrete mixture, according to manufacturer's written instructions, as shown on the plans.
7. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, as shown on the plans.
8. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, as shown on the plans.

G. Building Frame Members: Normal-weight concrete.
1. Minimum Compressive Strength: Minimum 4000 to 5000 PSI.
2. Maximum W/C Ratio: as per ACI- 301.
3. Slump Limit: as shown on the plans.
4. Air Content: as shown on the plans.

H. Building Walls: Normal-weight concrete.
1. Minimum Compressive Strength: 4000 PSI.
2. Maximum W/C Ratio: as per ACI- 301
3. Slump Limit: as shown on the plans.
4. Air Content: as shown on the plans.

2.16 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.17 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information and Environmental Product Declaration (EPD).
1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301 (ACI 301M), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

1. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch (25-mm) or 3/4-inch (19-mm) nominal maximum aggregate size as shown on the plans.

B. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
   1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
   2. Class as shown on the plans for rough-formed finished surfaces.

C. Construct forms tight enough to prevent loss of concrete mortar.

D. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
   1. Install keyways, reglets, recesses, and the like, for easy removal.
   2. Do not use rust-stained steel form-facing material.

E. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

F. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

G. Chamfer exterior corners and edges of permanently exposed concrete.

H. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

K. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
   2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
   3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
   1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
   2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORING AND RESHORING INSTALLATION

A. Comply with ACI 318 (ACI 318M) and ACI 301 (ACI 301M) for design, installation, and removal of shoring and reshoring.
   1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR-RETARDER INSTALLATION

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
   1. Lap joints 6 inches (150 mm) and seal with manufacturers recommended tape.

B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder according to manufacturer's written instructions.

3.6 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
   1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
   1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

F. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

G. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material according to ASTM A 780/A 780M. Use galvanized-steel wire ties to fasten zinc-coated steel reinforcement.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
   2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
   3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
   4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
   5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
   6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
   7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
   1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 WATERSTOP INSTALLATION

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.9 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M).
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.

2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.10 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete as shown on the plans.

C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:
1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 1 part Portland cement to 1-1/2 parts fine sand with a 1:1 mixture of bonding admixture and water. Add white Portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix 1 part Portland cement and 1 part fine sand with a 1:1 mixture of bonding agent and water. Add white Portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in one direction.
   1. Apply scratch finish to surfaces indicated on the plans.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
   1. Apply float finish to surfaces indicated on the plans

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
   1. Apply a trowel finish to surfaces indicated on the plans**.**
   2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
      a) Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
      b) Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
      c) Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for suspended slabs.
      d) Specified overall values of flatness, F(F) 45; and of levelness, F(L) 35; with minimum local values of flatness, F(F) 30; and of levelness, F(L) 24.
   3. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch (6 mm)

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated on the plans. While concrete is still plastic, slightly scarify surface with a fine broom.
   1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
   1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

G. Slip-Resistive Finish: Before final floating, apply slip-resistive aggregate finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
   1. Uniformly spread 25 lbs./100 sq. ft. (12 kg/10 sq. m) of dampened slip-resistive aggregate over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
   2. After broadcasting and tamping, apply float finish.
   3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate.

H. Dry-Shake Floor Hardener Finish: After initial floating, apply dry-shake floor hardener to surfaces according to manufacturer's written instructions and as follows:
   1. Uniformly apply dry-shake floor hardener at a rate of 100 lbs./100 sq. ft. (49 kg/10 sq. m) unless greater amount is recommended by manufacturer.
   2. Uniformly distribute approximately two-thirds of dry-shake floor hardener over surface by hand or with mechanical spreader, and embed by power floating. Follow power floating with a second dry-shake floor hardener application, uniformly distributing remainder of material, and embed by power floating.
   3. After final floating, apply a trowel finish. Cure concrete with curing compound recommended by dry-shake floor hardener manufacturer and apply immediately after final finishing.

3.12 MISCELLANEOUS CONCRETE ITEM INSTALLATION

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:
   1. Coordinate sizes and locations of concrete bases with actual equipment provided.
   2. Construct concrete bases as shown on the plans, and extend base not less than 6 inches (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
   3. Minimum Compressive Strength: As shown on the plans.
   4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
   5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
   6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.

Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.13 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 (ACI 301M) for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lbs./sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a) Water.
      b) Continuous water-fog spray.
      c) Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
      a) Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
      b) Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
      c) Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.
   3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
      a) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.
   4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial

application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 LIQUID FLOOR TREATMENT APPLICATION

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
   1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
   2. Do not apply to concrete that is less than 28 days' old.
   3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.15 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
   1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.16 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
   1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
   2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before

proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
   1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
   2. After concrete has cured at least 14 days, correct high areas by grinding.
   3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
   4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
   5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
   6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
   7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.17 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector or qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
   1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
   2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.
      a) When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
   3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
   4. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.
   6. Unit Weight: ASTM C 567/C 567M, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   7. Compression Test Specimens: ASTM C 31/C 31M.
      a) Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
      b) Cast and field cure two sets of two standard cylinder specimens for each composite sample.
   8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
      a) Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
      b) A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
   9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
   10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
   11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project

identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

E. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 24 hours of finishing.

3.18 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 033000

SECTION 033500
CONCRETE REPAIR WORK

PART 1- GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Concrete patching.
   2. Concrete repair work.

B. *Related Documents and Sections*: Examine Contract Documents for requirements that directly affect or are affected by Work of this Section. A list of those Documents and Sections includes, but is not limited to the following:
   1. Drawings and Contract Documents apply to this Section.

1.2 SUBMITTALS

A. Aggregate Test Reports and Mix Designs: Submit mix design including historical or trial mixture data, and aggregate test reports, as requested by the Architect.

1.3 QUALITY ASSURANCE

A. Employ an independent testing laboratory to test proposed aggregate and design of all concrete mixes, patching mixes, and floor underlayment mixes, as requested by the Architect.

B. Submit chemical and physical analysis of fly ash if used, as requested by Architect.

C. Use approved mix designs as long as aggregate characteristics remain unchanged. Upon significant changes in aggregate, prepare and submit new mix designs.

D. Authorizations: Obtain written authorization from Architect for use of admixtures not specified.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Place no concrete patching, cementitious floor underlayment, or concrete repair work without approval of Architect if air temperature is expected to rise above 85° F in work area.

PART 2- PRODUCTS

2.1 CONCRETE PATCHING

A. Concrete Patching (Horizontal Surfaces).
   1. Horizontal Patching Mortar- Design Criteria:
      a. Water -to- Cement Ratio:.40
      b. Slump Without PSP-N2: 1-1/2"
      c. With PSP-N2: 5-1/2"

d. Cement Factor, Nominal: 6.91 sq./yd
e. Air Content, Calculated: 6.5%

2. Horizontal Patching Mortar- Materials:
   a. Cement: ASTM C150, Type 1, Portland Cement, or equal.
   b. Aggregate:
      1) Coarse: ASTM C33, Size No. 7 (1/2" to No.4).
      2) Fine: ASTM C144.
   c. Admixtures:
      1) Plasticizer: ASTM C494, Type F; Protex Industries, Inc., "PSN-NZ",
      2) or an Approved Equal.

B. Concrete Patching (Vertical Surfaces).
   1. Vertical Patching Mortars: The vertical patching mortar shall be two-component latex and microsilica modified cementitious mortar designed for use as a vertical or overhead patching mortar.
   2. Material shall have the following properties:
      a. Compressive Strength minimum per ASTM C 109
         1) 7 days: 6,000 psi
         2) 28 days: 6,500 psi
      b. Flexural Strength minimum per ASTM C 348
         1) 7 days: 1,000 psi
         2) 28 days: 1,200 psi
      c. Spitting Tensile Strength per ASTM C 496
         1) 7 day: 700 psi
         2) 28 day: 800 psi
      d. Freeze Thaw Resistance of 300 Cycles Relative Dynamic Modulus > 80% per ASTM C 666
   3. *Mixing*. Add the factory prepared dry material to a mixture of three parts water to one part liquid admixture, in strict conformance with manufacturer's instructions. Mix to a "batter" consistency for the first coat and to a suitable heavy trowel consistency for patching.

2.2 CONCRETE REPAIR WORK

A. Concrete Repair Work (to be used when the repair is full depth- i.e. filling in a portion of slab that has been removed):
   1. Concrete may be ready-mixed or may be job-mixed at the Contractor's option, meeting requirements of Section 033000.
   2. *Reinforcing Steel Bars*: deformed bars from new billet stock, ASTM A615 Grade 60, and meet requirements of Section 033000.

PART 3- EXECUTION

3.1 HORIZONTAL PATCHING

A. Removal: In the areas, designated to be patched, the Contractor shall remove all deteriorated concrete down to sound concrete. The perimeter of each area to be patched shall be saw-cut to provide vertical faces around the patch. Depth shall be as directed by the Architect. All debris shall

be removed promptly by the Contractor. All reinforcing encountered shall be left in place, cleaned, and adjusted as may be necessary to provide for good cover after patching.

1. The Contractor shall exercise extreme caution in his removal operation so as not to disturb any existing reinforcing, anchor plates, etc.

B. *Surface Preparation*. Substrate must be sound, clean, free from oil, solvents, paint, dust and foreign material. Chip and/ or abrade painted concrete to expose clean surfaces. Scrub dirty surfaces with heavy duty caustic detergent and clear water flush. All areas to receive concrete patching shall be sand blasted, or as any option may be acid etched to remove laitance and efflorescence. If acid etched, neutralize with ammonia and clear water rinse twice.

1. Immediately prior to placing concrete patching mix, the slabs shall be thoroughly soaked with water. Free water shall be removed shortly before placing finish.

C. *Installation*. A thin cement wash proportioned of 15 pounds of Portland cement to 4 gallons of water shall be applied to the damp, but not wet, surface of the concrete slab to receive the concrete patching mix just prior to the applications. Limit application of cement wash to an area that can be covered with patching mortar before cement wash dries.

1. Concrete patching mixture shall be applied over the cement wash while the wash is still wet and/ or tacky. If the wash has hardened, another application must be made. Concrete patching shall be applied and troweled in, to form a dense, solid overlay with a uniform, granular surface. Sprinkle in sand as may be necessary to prevent glossy, slippery surfaces where there will be pedestrian and/ or vehicle traffic. As the patching work is completed, it shall be checked with straight-edges and level to assure that all surfaces will drain freely; correct as may be necessary before the material sets up.

3.2 VERTICAL PATCHING

A. *General*. All work shall be in accordance with the manufacturer's instructions.

1. Removal. In the areas designated by the Engineer, the Contractor shall remove all deteriorated concrete back to sound concrete. All debris shall be removed promptly by the Contractor. All reinforcing encountered shall be left in place cleaned and adjusted as may be necessary to provide for good cover after patching.
2. The Contractor shall exercise extreme caution in his removal operation so not to disturb any existing reinforcing, anchor plates, etc.

B. *Surface Preparation*. Substrate must be sound, clean, free from oil, solvents, dust and foreign material. Chip and/ or abrade oil saturated concrete to expose clean surfaces. The perimeter of each area to be patched shall be saw-cut to provide vertical faces around the patch. Depth shall be as directed by the Engineer. Loose concrete and rust on steel rods should be removed by sandblasting, chisel and hammer, or wire brush, as applicable. Heavy particles of concrete should be removed by air or electric hammer. Wash clean with water from hose before filling with patching material.

C. First coat shall be brush applied and worked under any exposed reinforcing bars and shall cover the complete patched area. Apply within ten minutes after the liquid has been added.

D. Patching mortar shall be trowel applied in 1/2" to 1" thick layers. Apply within five to ten minutes

after liquid is added to the mix. Apply in successive 1/2" to 1" layers. Scratch previous layer, cool with water and apply successive layer within 15 to 20 minutes. If patch gets hot and turns light gray, cool by wetting. Build up patch to restore original surface plane, or profile. As the patching work is completed, it shall be checked with straight-edges and level to assure that all surfaces are in accurate alignment; correct as may be necessary before the material sets up. Keep patch damp 20 to 30 minutes after filling to complete curing.

3.3 CONCRETE REPAIR

A. *Splicing Bars*: New reinforcing steel shall be clean and shall be free from paint, oil, grease, form coating, mortar, dirt, mill scale, rust, etc. A thin film of rust may be permitted at the discretion of the Architect provided the rust does not exceed that allowed by ASTM A615.

B. Existing reinforcing steel shall be reasonably clean of hardened cement, dirt and rust; and shall be bent back to approximately its position prior to being cut. New bars shall be placed across the gap and wired securely in place.

C. Lap for bars shall be as follows: bars in tension shall be lapped 36 diameters and bars in compression 24 diameters, but not less than 12" in either case.

D. *Placing Concrete*. No concrete which has commenced to set and no re-tempered concrete shall be used. Coordinate this work with the mechanical and electrical work. Work embedded shall be securely fastened in place.

1. Concrete shall be placed as soon as practicable after mixing. It shall be deposited in such manner as to cause no separation or segregation of the ingredients. Concrete shall not be dropped any considerable distance (not over four feet) through space. It shall not be deposited in large quantities at one place and permitted to run or be worked any considerable distance but shall be deposited in its final position as nearly as practicable. Concrete shall be rammed, spaded, and agitated by suitable tools so as to produce a thoroughly compacted concrete of maximum density; and so that the concrete will present a smooth, finished, unbroken mortar surface without exposed stone when the forms are removed. Use power vibrators wherever applicable and provide a spare vibrator at the site when starting each concrete placement operation.
2. A thin cement wash proportioned of 15 pounds of Portland cement to 4 gallons of water shall be applied to the dampened, but not wet, edges of the existing concrete slab.
    a. The temperature of the mixed cement shall not vary more than 10 degrees F plus or minus from the temperature of the concrete forming the slab which is to receive the cement patch.
    b. Finish: Troweled concrete shall be screeded, floated and troweled. The finished surface shall be free from trowel marks, uniform in texture and appearance and shall be a true plane within 3/16 inch in ten feet. Provide a troweled finish on floor slab patch as required to match existing slab finish.

E. *Curing*: Newly placed concrete shall be kept damp on all surfaces for seven full days following the completion of placement. Curing methods used shall be appropriate to each situation. Curing compound shall not be used. Curing shall not stain the concrete. Curing methods and maintenance thereof shall be subject to the Architect's approval.

3.4 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET.

END OF SECTION 033500

SECTION 034900
GLASS-FIBER-REINFORCED CONCRETE (GFRC)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Contract Documents apply to this Section.

1.2 SUMMARY

A. Section includes glass-fiber-reinforced concrete (GFRC) panels consisting of GFRC panel frames, anchors, and connection hardware.

1. GFRC panels include, but not limited to ceiling, wall, window wall unit, mullions, column covers, fascia units, cornices, soffits, trims, moldings.

B. Related Sections:

1. Division 03 Section "Cast-in-Place Concrete" for embedding anchorage devices.
2. Division 05 Section "Structural Steel Framing" for attaching connection devices to steel support framing.
3. Division 07 Section "Joint Sealants" for elastomeric joint sealants and sealant backings.

1.3 DEFINITIONS

A. Design Reference Sample: Sample of approved GFRC color, finish, and texture; preapproved by DCAS.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: GFRC panels, including panel frames, anchors, and connections, shall withstand the following design loads as well as the effects of thermal- and moisture-induced volume changes, according to load factors and combinations established in PCI MNL 128, "Recommended Practice for Glass Fiber Reinforced Concrete Panels."

1. Design Loads: As indicated on Construction Documents project and per applicable codes.
2. Deflection Limits: Design panel frames to withstand design loads without lateral deflections greater than 1/240 of wall span.
3. Thermal Movements: Provide for thermal movements resulting from annual ambient temperature changes of 75 deg F.
4. Design panel frames and connections to accommodate deflections and other building movements.
5. Design panel frames to transfer window loads to building structure.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include GFRC design mixes.

B. Shop Drawings: Show fabrication and installation details for GFRC panels including the following:

1. Structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Panel elevations, sections, and dimensions.
3. Thickness of facing mix, GFRC backing, and bonding pads for typical panels.
4. Finishes.
5. Joint and connection details.
6. Erection details.
7. Panel frame details for typical panels including sizes, spacings, thickness, and yield strength of various members.
8. Location and details of connection hardware attached to structure.
9. Size, location, and details of flex, gravity, and seismic anchors for typical panels.
10. Other items sprayed into panels.
11. Erection sequence for special conditions.
12. Relationship to adjacent materials.
13. Description of loose, cast-in, and field hardware.

C. Samples: Representative of finished exposed face of GFRC showing the full range of colors and textures specified, 12 by 12 inches and of actual thickness.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified GFRC manufacturer, including proof of current Precast/Prestressed Concrete Institute (PCI) or Architectural Precast Association (APA) Plant Certification.

B. Welding certificates.

C. Steel Sheet Certification: For steel sheet used in cold-formed steel panel framing.

D. Mill Certificates: For structural-steel shapes and hollow structural sections used in panel framing.

E. Source Quality-Control Program: For GFRC manufacturer.

F. Source Quality-Control Test Reports: For GFRC, inserts, and anchors.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that participates in PCI's Plant Certification Program and is designated a PCI-Certified Plant for Group G - Glass Fiber Reinforced Concrete or that participates in APA's Plant Certification Program and is certified for GFRC production.

1. Manufacturer's responsibility includes fabricating and installing certification with warranty GFRC panels and providing professional engineering services needed to assume engineering responsibility for GFRC panels if manufacturer is to install the GFRC.

2. Engineering responsibility includes preparation of Shop Drawings and comprehensive engineering analysis, based on GFRC production test values, by a qualified professional engineer experienced in GFRC design.

B. Steel Sheet Certifications: Obtain mill certificates signed by manufacturers of steel sheet, or test reports from a qualified testing agency, indicating that steel sheet used in cold-formed metal panel framing complies with requirements including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, and galvanized-coating thickness.

C. Mill Certificates: Obtain certified mill test reports from manufacturer of structural-steel shapes and hollow structural sections used in panel framing indicating compliance of these products with requirements.

D. Source Limitations: Obtain GFRC panels from single source from single manufacturer.

E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," and AWS D1.3, "Structural Welding Code - Sheet Steel."

F. PCI Manuals: Comply with requirements and recommendations in the following PCI manuals unless more stringent requirements are indicated:

1. PCI MNL 128, "Recommended Practice for Glass Fiber Reinforced Concrete Panels."
2. PCI MNL 130, "Manual for Quality Control for Plants and Production of Glass Fiber Reinforced Concrete Products."

G. AISI Specifications: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

H. AISC Specifications: Comply with ANSI/AISC 360, "Specification for Structural Steel Buildings."

I. Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical wall area as shown on Drawings as part of building.
2. In addition to GFRC panels, mockups include architectural precast concrete, unit masonry, aluminum windows, joint sealants, metal flashings and copings and as per DCAS request.
3. Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.

J. Preinstallation Conference: At DCAS discretion when the work is extensive or complex enough DCAS can request to conduct conference at the Project Site at no cost for DCAS.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Handle and transport GFRC panels to avoid damage.

1. Place nonstaining resilient spacers between panels.

2. Support panels on nonstaining material during shipment.
3. Protect panels from dirt and damage during handling and transport.

B. Store GFRC panels to protect from contact with soil, staining, and physical damage.

1. Store panels with nonstaining resilient supports in same positions as when transported.
2. Store panels on firm, level, and smooth surfaces.
3. Place stored panels so identification marks are clearly visible.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Stromberg Architectural Products.
2. GC Products, Inc.
3. ARC Limited.
4. Willis Construction.
5. CGA Stoneworks.
6. Clark Pacific.
7. ARC Limited.
8. Classic Stone Creations.
9. DeZi Construction.
10. Or an Approved Equal

2.2 MOLD MATERIALS

A. Molds: Rigid, dimensionally stable, nonabsorptive material, warp and buckle free, that will provide continuous and true GFRC surfaces; nonreactive with GFRC and capable of producing required finish surfaces.

1. Mold-Release Agent: Commercially produced liquid-release agent that will not bond with, stain, or adversely affect GFRC surfaces and will not impair subsequent surface or joint treatments of GFRC.

B. Form Liners: Units of face design, texture, arrangement, and configuration to match GFRC design reference sample. Provide solid backing and form supports to ensure that form liners remain in place during GFRC application. Use with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect GFRC surfaces and will not impair subsequent surface or joint treatments of GFRC.

C. Surface Retarder: Chemical liquid set retarder capable of temporarily delaying hardening of newly placed GFRC face mix to depth of reveal specified.

2.3 GFRC MATERIALS

A. Portland Cement: ASTM C 150; Type I, II, or III.

1. For surfaces exposed to view in finished structure, use gray or/and white of same type, brand, and source throughout GFRC production.
2. Metakaolin: ASTM C 618, Class N.

B. Glass Fibers: Alkali resistant, with a minimum zirconia content of 16 percent, 1 to 2 inches, specifically produced for use in GFRC, and complying with PCI MNL 130.

C. Sand: Washed and dried silica, complying with composition requirements in ASTM C 144; passing No. 20 sieve with a maximum of 2 percent passing No. 100 sieve.

D. Facing Aggregate: ASTM C 33, except for gradation, and PCI MNL 130, 1/4-inch maximum size.

1. Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match sample.

E. Coloring Admixture: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures, temperature stable, nonfading, and alkali resistant.

F. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of GFRC and complying with chemical limits of PCI MNL 130.

G. Polymer-Curing Admixture: Acrylic thermoplastic copolymer dispersion complying with PCI MNL 130.

H. Air-Entraining Admixture: ASTM C 260, containing not more than 0.1 percent chloride ions.

I. Chemical Admixtures: ASTM C 494/C 494M, containing not more than 0.1 percent chloride ions.

2.4 ANCHORS, CONNECTORS, AND MISCELLANEOUS MATERIALS

A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M. Finish steel shapes and plates less than 3/16 inch thick as follows:

Level of corrosion as defined on Construction Documents should comply with the following:

1. Finish: Zinc coated by hot-dip process according to ASTM A 123/A 123M, after fabrication, or ASTM A 153/A 153M, as applicable, and electrodeposition according to ASTM B 633, SC 3.
2. Finish: Shop primed with MPI#79 and SSPC-Paint 25 on surfaces prepared to comply with SSPC-SP 2, "Hand Tool Cleaning," or better.

B. Carbon-Steel Bars: ASTM A 108, AISI Grade 1018. Finish steel bars less than 3/16 inch thick as follows:

Level of corrosion as defined on Construction Documents should comply with the following:

1. Finish: Zinc coated by hot-dip process according to ASTM A 123/A 123M, after fabrication, or ASTM A 153/A 153M, as applicable or electrodeposition according to ASTM B 633, SC 3.
2. Finish: Shop primed with MPI#79 and SSPC-Paint 25 on surfaces prepared to comply with SSPC-SP 2, "Hand Tool Cleaning," or better.

C. Malleable-Iron Castings: ASTM A 47/ A 47M, Grade 32510
D. Carbon-Steel Castings: ASTM A 27/A 27M, Grade 60-30

E. Bolts: ASTM A 307 or ASTM A 325
1. Finish: Zinc coated by hot-dip process according to ASTM A 123/A 123M, after fabrication, and ASTM A 153/A 153M, as applicable or electrodeposition according to ASTM B 633, SC 3.

F. Reglets: PVC extrusions.

2.5 PANEL FRAME MATERIALS

A. Cold-Formed Steel Framing: Manufacturer's standard C-shaped steel studs, complying with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members," minimum uncoated steel thickness of 0.053 inch of web depth indicated on Project Construction Documents, with stiffened flanges, U-shaped steel track, and of the following steel sheet:
1. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, structural-steel sheet, G60 or G90 zinc coating, of grade required by structural performance of framing.
2. Painted, Nonmetallic-Coated Steel Sheet: ASTM A 1011/A 1011M, hot rolled; or ASTM A 1008/A 1008M, cold rolled; nonmetallic coated according to ASTM A 1003/A 1003M; of grade required by structural performance of framing.

B. Hollow Structural Sections: Steel tubing, ASTM A 500, Grade B, or ASTM A 513. Finish hollow structural sections with wall thickness less than 3/16 inch as follows:
1. Organic Zinc-Rich Primer: SSPC-Paint 20 on surfaces prepared to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Primer: MPI#79 and SSPC-Paint 25 on surfaces prepared to comply with SSPC-SP 2, "Hand Tool Cleaning," or better.

C. Steel Channels and Angles: ASTM A 36/A 36M, finished as follows:
1. Organic Zinc-Rich Primer: SSPC-Paint 20 on surfaces prepared to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Primer: MPI#79 and SSPC-Paint 25 on surfaces prepared to comply with SSPC-SP 2, "Hand Tool Cleaning," or better.

2.6 GFRC MIXES

A. Backing Mix: Proportion backing mix of portland cement, glass fibers, sand, and admixtures to comply with design requirements. Provide nominal glass-fiber content of not less than 5 percent by weight of total mix.

B. Face Mix: Proportion face mix of portland cement, sand, facing aggregates, and admixtures to comply with design requirements.

C. Mist Coat: Portland cement, sand slurry, and admixtures; of same proportions as backing mix without glass fibers. (No needed if retaining face or if GFRC is faced with dimension stone or another veneer).

D. Polymer-Curing Admixture: 6 to 7 percent by weight of polymer-curing admixture solids to dry
portland cement.

E. Air Content: 8 to 10 percent; ASTM C 185. (If GFRC panels are exposed to freeze-thaw conditions and GFRC manufacturer does not use polymer-curing admixture. Air content range is based on PCI MNL 130 recommendations for freeze-thaw conditions).

F. Coloring Admixture: Not to exceed 10 percent of cement weight.

2.7 PANEL FRAME FABRICATION

A. Fabricate panel frames and accessories plumb, square, true to line, and with components securely fastened, according to Shop Drawings and requirements in this Section.

1. Fabricate panel frames using jigs or templates.
2. Cut cold-formed metal framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
4. Fasten framing members of hollow structural sections, steel channels, or steel angles by welding. Comply with AWS D1.1/D1.1M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
5. Weld flex, gravity, and seismic anchors to panel frames.

B. Reinforce, stiffen, and brace framing assemblies, if necessary, to withstand handling, delivery, and erection stresses. Lift fabricated assemblies in a manner that prevents damage or significant distortion.

C. Galvanizing Repair: Touch up accessible damaged galvanized surfaces according to ASTM A 780 (for galvanized surfaces).

D. Painting Repair: Touch up accessible damaged painted surfaces using same primer (for prime-painted surfaces).

2.8 MOLD FABRICATION

A. Construct molds that will result in finished GFRC complying with profiles, dimensions, and tolerances indicated, without damaging GFRC during stripping. Construct molds to prevent water leakage and loss of cement paste.

1. Coat contact surfaces of molds with form-release agent.
2. Coat contact surfaces of molds with surface retarder. (When exposed-aggregate surfaces require surface retarder to achieve desired finish)

B. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during GFRC application. Coat form liner with form-release agent.

C. Locate, place, and secure flashing reglets accurately.

2.9 GFRC FABRICATION

A. Proportioning and Mixing: For backing mix, meter sand/cement slurry and glass fibers to spray head at rates to achieve design mix proportions and glass-fiber content according to PCI MNL 130 procedures.

B. Spray Application: Comply with general procedures as follows:

1. Spray mist coat over molds to a nominal thickness of 1/8 inch on planar surfaces. Or Spray or place face mix in thickness indicated on Shop Drawings.
2. Proceed with spraying backing mix before face mix or mist coat has set, using procedures that produce a uniform thickness and even distribution of glass fibers and matrix.
3. Consolidate backing mix by rolling or other technique to achieve complete encapsulation of glass fibers and compaction.
4. Measure thickness with a pin gage or other acceptable method at least once for each 5 sq. ft. of panel surface. Take not less than six measurements per panel.

C. Hand form and consolidate intricate details, incorporate formers or infill materials, and over spray before material reaches initial set to ensure complete bonding.

D. Attach panel frame to GFRC before initial set of GFRC backing, maintaining a minimum clearance of 1/2 inch from GFRC backing, and without anchors protruding into GFRC backing.

E. Build up homogeneous GFRC bonding pads over anchor feet, maintaining a minimum thickness of 1/2 inch over tops of anchor feet, before initial set of GFRC backing.

F. Inserts and Embedment: Build up homogeneous GFRC bosses or bonding pads over inserts and embedment to provide sufficient anchorage and embedment to comply with design requirements.

G. Curing: Employ initial curing method that will ensure sufficient strength for removing units from mold. Comply with PCI MNL 130 procedures.

H. Panel Identification: Mark each GFRC panel to correspond with identification mark on Shop Drawings. Mark each panel with its casting date.

2.10 FABRICATION TOLERANCES

A. Manufacturing Tolerances: Manufacture GFRC panels so each finished unit complies with PCI MNL 130 for dimension, position, and tolerances.

B. Manufacturing Tolerances: Manufacture GFRC panels so each finished unit complies with the following dimensional tolerances. For dimensional tolerances not listed below, comply with PCI MNL 130.

**Manufacturers may be able to comply with closer tolerances if required by DCAS.

1. Overall, Height and Width of Units, measured at the Face Adjacent to Mold: As follows:
    a) 10 feet or less, plus or minus 1/8 inch
    b) More than 10 feet , plus or minus 1/8 inch per 10 feet , 1/4 inch maximum.
2. Edge Return Thickness: Plus 1/2 inch , minus 0 inch
3. Architectural Facing Thickness: Plus 1/8 inch minus 0 inch
4. Backing Thickness: Plus 1/4 inch minus 0 inch
5. Panel Depth from Face of Skin to Back of Panel Frame or Integral Rib: Plus 3/8 inch minus 1/4 inch
6. Angular Variation of Plane of Side Mold: Plus or minus 1/32 inch per 3 inches (of depth or plus or minus 1/16 inch total, whichever is greater.
7. Variation from Square or Designated Skew (Difference in Length of Two Diagonal Measurements): Plus or minus 1/8 inch per 72 inches or plus or minus 1/4 inch total, whichever is greater.
8. Local Smoothness: 1/4 inch per 10 feet
9. Bowing: Not to exceed L/240 unless unit meets erection tolerances using connection adjustments.
10. Length and Width of Block Outs and Openings within One Unit: Plus or minus 1/4 inch
11. Location of Window Opening within Panel: Plus or minus 1/4 inch
12. Maximum Permissible Warpage of One Corner out of the Plane of the Other Three: 1/16 inch per 12 inches of distance from nearest adjacent corner.

C. Position Tolerances: Measured from datum line locations, as indicated on Shop Drawings.

1. Panel Frame and Track: Plus, or minus 1/4 inch
2. Flashing Reglets at Edge of Panel: Plus, or minus 1/4 inch
3. Inserts: Plus, or minus 1/2 inch
4. Special Handling Devices: Plus, or minus 3 inches
5. Location of Bearing Devices: Plus, or minus 1/4 inch
6. Blockouts: Plus, or minus 3/8 inch).

D. Panel Frame Tolerances: As follows:

1. Vertical and Horizontal Alignment: 1/4 inch per 10 feet
2. Spacing of Framing Member: Plus, or minus 3/8 inch
3. Squareness of Frame: Difference in length of diagonals of 3/8 inch
4. Overall Size of Frame: Plus, or minus 3/8 inch

2.11 FINISHES

A. Finish exposed-face surfaces of GFRC as follows to match approved design reference sample and mockups by DCAS. Panel faces shall be free of joint marks, grain, or other obvious defects.

1. Design Reference Sample: As defined by DCAS Architect or engineer or on DCAS design project Construction Document including manufacturer and code number of sample.
2. As-Cast-Surface Finish: Provide free of sand streaks, honeycombs, and excessive air voids, with uniform color and texture.
3. Textured-Surface Finish: Impart by form liners to provide surfaces free of sand streaks, honeycombs, and excessive air voids, with uniform color and texture.
4. Retarded Finish: Use chemical-retarding agents applied to concrete forms and washing and brushing procedures to expose aggregate and surrounding matrix surfaces after form removal.
5. Sand- or Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces.
6. Acid-Etched Finish: Use acid and hot-water solution equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces.

2.12 SOURCE QUALITY CONTROL

A. Quality-Control Testing: Establish and maintain a quality-control program for manufacturing GFRC panels according to PCI MNL 130.

1. Test materials and inspect production techniques.
2. Quality-control program shall monitor glass-fiber content, spray rate, unit weight, product physical properties, anchor pull-off and shear strength, and curing period and conditions.
3. Prepare test specimens and test according to ASTM C 1228, PCI MNL 130, and PCI MNL 128 procedures.
4. Test GFRC inserts and anchors according to ASTM C 1230 to validate design values.
5. Produce test boards at a rate not less than one per work shift per operator for each spray machine and for each mix design.
    a) For each test board, determine glass-fiber content according to ASTM C 1229, and flexural yield and ultimate strength according to ASTM C 947.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine structure and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

A. Install clips, hangers, and other accessories required for connecting GFRC panels to supporting members and backup materials.

B. Lift GFRC panels and install without damage.

C. Install GFRC panels level, plumb, square, and in alignment. Provide temporary supports and bracing as required to maintain position, stability, and alignment of panels until permanent connections are completed.

1. Maintain horizontal and vertical joint alignment and uniform joint width.
2. Remove projecting hoisting devices.

D. Connect GFRC panels in position by bolting or welding, or both, as indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as possible after connecting is completed.

E. Welding: Comply with applicable AWS D1.1/D1.1M and AWS D1.3 requirements for welding, appearance, quality of welds, and methods used in correcting welding work.

1. Protect GFRC panels from damage by field welding or cutting operations, and provide noncombustible shields as required.

F. At bolted connections, use lock washers or other acceptable means to prevent loosening of nuts.

3.3 ERECTION TOLERANCES

A. Erect GFRC panels to comply with the following noncumulative tolerances:

1. Plan Location from Building Grid Datum: Plus or minus 1/2 inch
2. Top Elevation from Nominal Top Elevation: As follows:
    a) Exposed Individual Panel: Plus or minus 1/4 inch.
    b) Nonexposed Individual Panel: Plus or minus 1/2 inch
    c) Exposed Panel Relative to Adjacent Panel: 1/4 inch
    d) Nonexposed Panel Relative to Adjacent Panel: 1/2 inch
3. Support Elevation from Nominal Elevation: As follows:
    a) Maximum Low: 1/2 inch
    b) Maximum High: 1/4 inch
4. Maximum Plumb Variation over the Lesser of Height of Structure or 100 Feet 1 inch
5. Plumb in Any 10 Feet of Element Height: 1/4 inch
6. Maximum Jog in Alignment of Matching Edges: 1/4 inch
7. Maximum Jog in Alignment of Matching Faces: 1/4 inch
8. Face Width of Joint: As follows (governs over joint taper):
    a) Panel Dimension 20 Feet or Less: Plus or minus 1/4 inch
    b) Panel Dimension More Than 20 Feet: Plus or minus 5/16 inch
9. Maximum Joint Taper: 3/8 inch
10. Joint Taper in 10 Feet: 1/4 inch
11. Differential Bowing, as Erected, between Adjacent Members of Same Design: 1/4 inch

3.4 REPAIRS

When using galvanized framing, anchors, connections, and other items, comply with the following:

A. Repairs will be permitted provided structural adequacy of GFRC panel and appearance are not impaired, as approved by Architect.
B. Mix patching materials and repair GFRC so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces.

C. Prepare and repair accessible damaged galvanized coatings with galvanizing repair paint according to ASTM A 780.

When items are prime painted, comply with the following:

A. Wire brush, clean, and paint accessible weld areas on prime-painted components with same type of shop primer.

B. Remove and replace damaged GFRC panels when repairs do not comply with requirements.

3.5 CLEANING AND PROTECTION

A. Perform cleaning procedures, if necessary, according to GFRC manufacturer's written instructions. Clean soiled GFRC surfaces with detergent and water, using soft fiber brushes and sponges, and rinse with clean water. Prevent damage to GFRC surfaces and staining of adjacent materials.

END OF SECTION 034900

SECTION 035216
LIGHTWEIGHT INSULATING CONCRETE

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Contract Documents apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place, perlite aggregate, vermiculite aggregate, cellular lightweight insulating concrete.

B. Related Sections:
1. Division 03 Section "Cast-in-Place Concrete" for requirements for normal-weight and structural lightweight concrete, including formwork, reinforcement, and concrete materials and mixes.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include mixing and application instructions for each type of lightweight insulating concrete.

B. Shop Drawings: Include plans, sections, and details, lightweight insulating concrete thicknesses, embedded insulation board, roof penetrations, roof perimeter terminations and curbs, control and expansion joints, and roof drains.

C. Design Mixtures: For each lightweight insulating concrete mix.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and testing agency.

B. Product Certificates: For the following, from manufacturer:
1. Cementitious materials.
2. Foaming agents.
3. Admixtures.
4. Molded-polystyrene insulation board.

C. Material Test Reports: For lightweight aggregates, from a qualified testing agency, indicating compliance with requirements.

D. Research/Evaluation Reports: For lightweight insulating concrete, from a certified testing lab.

E. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An Installer who employs and retains, throughout the project, supervisors who are trained and approved by manufacturer.
   1. A firm that has been evaluated by UL and found to comply with requirements of the National Roof Deck Contractors Association Lightweight Insulating Concrete Roof Deck Contractors (LWIC) Accreditation Program.

B. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

C. Fire-Resistance Ratings: Where indicated, provide lightweight insulating concrete identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency.
   1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

D. FM Approvals Listing: Provide lightweight insulating concrete evaluated by FM Approvals as part of a roof assembly and listed in FM Approvals' "RoofNav" for Class 1 or noncombustible construction, as applicable.

E. Provide vermiculite aggregates containing no detectable asbestos as determined by method specified in 40 CFR 763, Subpart E, Appendix E, Section 1, "Polarized Light Microscopy."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original undamaged packages or acceptable bulk containers.

B. Store packaged materials to protect them from elements or physical damage.

C. Do not use cement that shows indications of moisture damage, caking, or other deterioration.

1.7 PROJECT CONDITIONS

A. Do not place lightweight insulating concrete unless ambient temperature is at least 40 deg F and rising.
   1. When air temperature has fallen or is expected to fall below 40 deg F, heat water to a maximum 120 deg F before mixing so lightweight insulating concrete, at point of placement, reaches a temperature of 50 deg F minimum and 80 deg F maximum.

B. Do not place lightweight insulating concrete during rain or snow or on surfaces covered with standing water, snow, or ice.

PART 2- PRODUCTS

2.1 MATERIALS

A. Cementitious Material: Portland cement, ASTM C 150, Type I/II. Supplement with fly ash, ASTM C 618, Class C or F.

B. Lightweight Mineral Aggregate: ASTM C 332, Group I, vermiculite or perlite.

C. Foaming Agent: ASTM C 869.

D. Water: Clean, potable.

E. Air-Entraining Admixture: ASTM C 260.

F. Joint Filler: ASTM C 612, Class 2, glass-fiber type; compressing to one-half thickness under a load of 25 psi.

G. Steel Wire Mesh: Cold-drawn steel wire, galvanized, 0.041-inch diameter, woven into 2-inch hexagonal mesh, and reinforced with a longitudinal 0.062-inch diameter wire spaced 3 inches apart.

1. Products: Subject to compliance with requirements, of available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Keystone Steel & Wire; Keydeck Style No. 2160-2-1619 Reinforcing Mesh.
   b. Dorstener Wire Tech.
   c. McNichols Wire Mesh.
   d. Or an Approved Equal.

H. Galvanized Plain- Steel Welded Wire Reinforcement: ASTM A 185/A 185M, 2 by 2 inches, W0.5 by W0.5, fabricated from galvanized steel wire into flat sheets.

I. Molded-Polystyrene Insulation Board: ASTM C 578, Type I, 0.90-lb/cu. ft. minimum density.

1. Provide units with manufacturer's standard keying slots of approximately 3 percent of board's gross surface area.

2.2 DESIGN MIXTURES

A. Prepare design mixtures for each type and strength of lightweight insulating concrete by laboratory trial batch method or by field-test data method. For trial batch method, use a qualified independent testing agency for preparing and reporting proposed mixture designs.

1. Limit use of fly ash to not exceed 25 percent of portland cement by weight.

B. Limit water-soluble chloride ions to the maximum percentage by weight of cement or cementitious material permitted by ACI 301.

2.3 AGGREGATE LIGHTWEIGHT INSULATING CONCRETE

A. Produce lightweight insulating concrete using the minimum amount of water necessary to produce a workable mix.
   1. Do not exceed maximum air content recommended by aggregate manufacturer.

B. Perlite Aggregate Mix: Lightweight insulating concrete produced from cementitious materials, water, air-entraining admixture, and perlite mineral aggregates.
   1. Manufacturers: Subject to compliance with requirements, of available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Airlite Processing Corporation of Florida.
      b. Carolina Perlite Company.
      c. Harborlite Corporation.
      d. Redco II.
      e. Silbrico Corporation.
      f. Sun Gro Horticulture.
      g. Or an Approved Equal.
   2. As-Cast Unit Weight: 38 to 44 lb/cu. ft. at point of placement, when tested according to ASTM C 138/C 138M.
   3. Oven-Dry Unit Weight: 24 to 30 lb/cu. ft., when tested according to ASTM C 495.
   4. Compressive Strength: Minimum 125 psi, when tested according to ASTM C 495.
   5. Cement-to-Aggregate Ratio, by Volume: 1:6.

C. Vermiculite Aggregate Mix: Lightweight insulating concrete produced from cementitious materials, water, air-entraining admixture, and vermiculite mineral aggregates.
   1. Manufacturers: Subject to compliance with requirements, of available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Palmetto Vermiculite Company.
      b. Siplast.
      c. Sun Gro Horticulture.
      d. Or Approved Equal
   2. As-Cast Unit Weight: 45 to 49 lb./cu. ft. at point of placement, when tested according to ASTM C 138/C 138M.
   3. Oven-Dry Unit Weight: 23 to 26 lb./cu. ft., when tested according to ASTM C 495.
   4. Compressive Strength: Minimum 140 psi, when tested according to ASTM C 495.
   5. Cement-to-Aggregate Ratio, by Volume: 1:6.
   6. As-Cast Unit Weight: 44 to 60 lb./cu. ft. at point of placement, when tested according to ASTM C 138/C 138M.
   7. Oven-Dry Unit Weight: 22 to 28 lb./cu. ft., when tested according to ASTM C 495.
   8. Compressive Strength: Minimum 125 psi, when tested according to ASTM C 495.
   9. Cement-to-Aggregate Ratio, by Volume: 1:6.

10. As-Cast Unit Weight: 60 to 68 lb./cu. ft. at point of placement, when tested according to ASTM C 138/C 138M.
11. Oven-Dry Unit Weight: 34 to 42 lb./cu. ft., when tested according to ASTM C 495.
12. Compressive Strength: Minimum 300 psi, when tested according to ASTM C 495.
13. Cement-to-Aggregate Ratio, by Volume: 1:3.5.

2.4 CELLULAR LIGHTWEIGHT INSULATING CONCRETE

A. Produce cellular lightweight insulating concrete with the following minimum physical properties using cementitious materials, air-producing liquid-foaming agents, and the minimum amount of water necessary to produce a workable mix.
   1. Manufacturers: Subject to compliance with requirements, of available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Celcore Incorporated.
      b. Cellular Concrete LLC, Mearlcrete Division.
      c. Elastizell Corporation of America.
      d. Lite-Crete Inc.
      e. Siplast.
      f. Or an Approved Equal
   2. As-Cast Unit Weight: 4 to 42 lb./cu. ft. at point of placement, when tested according to ASTM C 138/C 138M.
   3. Oven-Dry Unit Weight: 6 to 32 lb./cu. ft., when tested according to ASTM C 495.
   4. Compressive Strength: Minimum 190 psi, when tested according to ASTM C 495.
   5. As-Cast Unit Weight: 4 to 42 lb./cu. ft. at point of placement, when tested according to ASTM C 138/C 138M.
   6. Oven-Dry Unit Weight: 8 to 32 lb./cu. ft., when tested according to ASTM C 495.
   7. Compressive Strength: Minimum 200 psi, when tested according to ASTM C 495.
   8. As-Cast Unit Weight: 8 to 48 lb./cu. ft. at point of placement, when tested according to ASTM C 138/C 138M.
   9. Oven-Dry Unit Weight: 0 to 36 lb./cu. ft., when tested according to ASTM C 495.
   10. Compressive Strength: Minimum 200 psi, when tested according to ASTM C 495.

PART 3- EXECUTION

3.1 PREPARATION

A. Control Joints: Install control joints at perimeter of roof deck and at junctures with vertical surfaces, including curbs, walls, and vents, for full depth of lightweight insulating concrete. Fill control joints with joint filler.

1. Provide 1-inch- wide control joints for roof dimensions up to 100 feet in length; 1-1/2- inch- wide control joints for roof dimensions exceeding 100 feet.

B. Wire Mesh: Place steel wire mesh with longest dimension perpendicular to steel deck ribs. Cut mesh to fit around roof openings and projections. Terminate mesh at control joints. Lap sides and ends of mesh at least 6 inches.

C. Welded Wire Reinforcement: Place steel welded wire reinforcement with longest dimension perpendicular to steel deck ribs. Cut reinforcement to fit around roof openings and projections. Terminate reinforcement at control joints. Lap sides and ends of reinforcement at least 6 inches.

3.2 MIXING AND PLACING

A. Mix and place lightweight insulating concrete according to manufacturer's written instructions, using equipment and procedures to avoid segregation of mixture and loss of air content.

B. Install insulation board according to lightweight insulating concrete manufacturer's written instructions. Place insulation board in wet, lightweight insulating concrete slurry poured a minimum of 1/8 inch over the structural substrate. Ensure full contact of insulation board with slurry. Stagger joints and tightly butt insulation boards.
1. Install insulation board in a stair-step configuration with a maximum step-down of 1 inch.

C. Deposit and screed lightweight insulating concrete in a continuous operation until an entire panel or section of roof area is completed. Do not vibrate or work mix except for screeding or floating. Place to depths and slopes indicated.

D. Finish top surface smooth, free of ridges and depressions, and maintain surface in condition to receive subsequent roofing system.

E. Begin curing operations immediately after placement, and air cure for not less than three days, according to manufacturer's written instructions.

F. If ambient temperature falls below 40 deg F, protect lightweight insulating concrete from freezing and maintain temperature recommended by manufacturer for 72 hours after placement.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to sample materials, perform field tests and inspections, and prepare test reports.

B. Testing of samples of lightweight insulating concrete obtained according to ASTM C 172, except as modified by ASTM C 495, shall be performed

according to the following requirements:

1. Determine as-cast unit weight during each hour of placement, according to ASTM C 138/C 138M.
2. Determine oven-dry unit weight and compressive strength according to ASTM C 495. Make a set of at least six molds for each day's placement, but not less than one set of molds for each 3000 sq. ft. of roof area.
3. Perform additional tests when test results indicate that as-cast unit weight, oven-dry unit weight, compressive strength, or other requirements have not been met.
    a. Retest cast-in-place lightweight insulating concrete for oven-dry unit weight and compressive strength.

3.4 DEFECTIVE WORK

A. Refinish, or remove and replace, lightweight insulating concrete if surfaces are excessively scaled or too rough to receive roofing according to roofing membrane manufacturer's written instructions.

B. Remove and replace lightweight insulating concrete that fails to comply with requirements.

END OF SECTION 035216

SECTION 035300
CONCRETE TOPPING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Contract Documents apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Emery-aggregate concrete floor topping.
   2. Iron-aggregate concrete floor topping.

B. Related Sections:
   1. Division 09 Section "Tiling" for medium-set and thickset mortar beds for tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by qualified testing agency, for concrete floor topping.

B. Field quality-control test reports. (Contractor is responsible for field quality-control testing).

1.5 QUALITY ASSURANCE

DCAS approval is needed when Contractor or manufacturer selects testing agency.

A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

B. Mockups: Place concrete floor topping mockups to demonstrate typical joints, surface finish, bonding, texture, tolerances, and standard of workmanship.
   1. Build mockups approximately 50 sq. ft. in the location indicated by DCAS or, if not indicated, as directed by Architect.
   2. If Architect or DCAS determines that mockups do not meet requirements, demolish and remove them from the site and cast others until mockups are approved.
   3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion at sole discretion of DCAS.

C. Preinstallation Conference: If work of this Section is extensive or complex enough, DCAS can request and Conduct Preinstallation Conference at the project location at no cost for DCAS.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage, mixing with other components, and application.

B. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting concrete floor topping performance.
   1. Place concrete floor topping only when ambient temperature and temperature of base slabs are between 50 and 86 deg F or as per manufacturer recommendation limits.

B. Close areas to traffic during topping application and, after application, for time period recommended in writing by manufacturer.

PART 2 - PRODUCTS

2.1 CONCRETE FLOOR TOPPINGS

A. Emery-Aggregate Concrete Floor Topping: Factory-prepared and dry-packaged mixture of graded, crushed emery aggregate containing not less than 50 percent aluminum oxide, not less than 24 percent ferric oxide, and not more than 8 percent silica; portland cement or blended hydraulic cement; plasticizers; and other admixtures to which only water needs to be added at Project site.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a) Anti-Hydro International, Inc.; A-H Emery A-1 Premix.
      b) CONSPEC, by Dayton Superior; Conspec Emery Topping.
      c) Dayton Superior Corporation; Emery Tuff Top.
      d) L&M Construction Chemicals, Inc.; Emerytop 400.
      e) Metalcrete Industries; Met-Top E.
      f) US Concrete Materials, LLC; Florundum Emery 1-T Premix.
      g) Or an Approved Equal
   2. Compressive Strength (28 Days): 5,000 psi; ASTM C 109/C 109M.

B. Iron-Aggregate Concrete Floor Topping: Factory-prepared and dry-packaged mixture of graded iron aggregate, portland cement, plasticizers, and other admixtures to which only water needs to be added at Project site.
   1. Products: Subject to compliance with requirements available products that may be incorporated into the Work include, but are not limited to, the following:
   2. Anti-Hydro International, Inc.; A-H Irontop.
      a) BASF Construction Chemicals, LLC; Mastertop Anvil-Top 300.
      b) CONSPEC, by Dayton Superior; Conplate Floor Topping.
      c) EDOCO, by Dayton Superior; Burke Iron Topping.
      d) Euclid Chemical Company (The); Super Euco-Top.
      e) Metalcrete Industries; Metalcrete.

f) US Concrete Materials, LLC; Ferrotop.
g) Or an Approved Equal

3. Compressive Strength (28 Days): 5,000 psi; ASTM C 109/C 109M

2.2 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 25 percent solids content, minimum. (Curing compounds to comply with maximum VOC emission limits of authorities having jurisdiction).

2.3 RELATED MATERIALS

A. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A Shore durometer hardness of 80 and aromatic polyurea with a Type A Shore durometer hardness range of 90 to 95 per ASTM D 2240.

B. Joint-Filler Strips: If used in isolation joints use ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
**Use the following if bonding slurry is used on new, hardened concrete. Slurry recommendations of topping manufacturers shall include neat cement and water; cement, sand, and water; and cement, sand, water, and acrylic-bonding agent to be approved by DCAS.

C. Portland Cement: ASTM C 150, Type I or II.

D. Sand: ASTM C 404, fine aggregate passing No. 16 sieve.

E. Water: Potable.

F. Acrylic-Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
*** Use the following for bonding topping to dry new concrete or dry old concrete.

G. Epoxy Adhesive: ASTM C 881/C 881M, Type V, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements.

2.4 MIXING

A. Bonding Slurry: Mix portland cement with water to a thick paint consistency. (If bonding slurry is used to bond topping to new, hardened concrete) or (if mixing a neat-cement slurry).

B. Bonding Slurry: Mix 1 part portland cement and (1-1/2) or (2) or (2-1/2) parts sand with water and an acrylic-bonding agent according to manufacturer's written instructions to a thick paint consistency. (If bonding slurry is used to bond topping to new, hardened concrete or if mixing a sand-cement slurry alone or in combination with an acrylic-bonding agent).

C. Floor Topping: Mix concrete floor topping materials and water in appropriate drum-type batch machine mixer or truck mixer according to manufacturer's written instructions. (If epoxy adhesive is required for existing, aged concrete or if topping is monolithically placed on plastic concrete).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance of concrete floor topping.
** For deferred floor topping placed over new, hardened concrete slab.

B. Verify that base concrete slabs comply with scratch finish requirements specified in Division 03 Section "Cast-in-Place Concrete."
** If placing topping over existing, aged concrete slab. Test method below requires at least 16 hours and:

C. Verify that base slabs are visibly dry and free of moisture. Test for capillary moisture by the plastic sheet method according to ASTM D 4263.

D. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Existing Concrete: Remove existing surface treatments and deteriorated and unsound concrete. Mechanically abrade base slabs to produce a heavily scarified surface profile with an amplitude of 1/4 inch included in the cost when required by DCAS.
1. Prepare and clean existing base slabs according to concrete floor topping manufacturer's written instructions. Fill voids, cracks, and cavities in base slabs.
2. Mechanically remove contaminants from existing concrete that might impair bond of floor topping.
3. Saw cut contraction and construction joints in existing concrete to a depth of 1/2 inch and fill with semirigid joint filler. (If existing joints are not already filled with a semirigid joint filler).
4. Retain subparagraph below to minimize edge curling and delamination of concrete floor topping at joints and perimeter. Retain option recommended by concrete floor topping manufacturer.
5. Minimize edge curling and delamination of concrete floor topping at joints and perimeter,
6. To both sides of joint edges and at perimeter of existing base slab mechanically remove a 4-inch-wide and 0- to 1-inch deep, tapered wedge of concrete and retexture surface and install concrete nails in manufacturer's recommended staggered pattern.

B. Install joint-filler strips where topping abuts vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with topping surface, unless otherwise indicated.
2. Terminate full-width, joint-filler strips 1/2 inch below topping surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.3 FLOOR TOPPING APPLICATION

A. Start floor topping application in presence of manufacturer's technical representative.

B. Monolithic Floor Topping: After textured-float finish is applied to fresh concrete of base slabs specified in Division 03 Section "Cast-in-Place Concrete," place concrete floor topping while concrete is still plastic.

C. Deferred Floor Topping: Within 72 hours of placing base slabs, mix and scrub bonding slurry into dampened concrete to a thickness of 1/16 to 1/8 inch without puddling. Place floor topping while slurry is still tacky. (If bonding floor topping to new, hardened concrete)

D. Existing Concrete: Apply epoxy-bonding adhesive, mixed according to manufacturer's written instructions, and scrub into dry base slabs to a thickness of 1/16 to 1/8 inch without puddling. Place floor topping while adhesive is still tacky. (If using epoxy-bonding adhesive over existing base slabs).

E. Place concrete floor topping continuously in a single layer, tamping and consolidating to achieve tight contact with bonding surface. Do not permit cold joints or seams to develop within pour strip.
1. Screed surface with a straightedge and strike off to correct elevations.
2. Slope surfaces uniformly where indicated.
3. Begin initial floating using bull floats to form a uniform and open-textured surface plane free of humps or hollows.

F. Finishing: Consolidate surface with power-driven floats as soon as concrete floor topping can support equipment and operator. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until concrete floor topping surface has a uniform, smooth, granular texture.
1. Hard Trowel Finish: After floating surface, apply first trowel finish and consolidate concrete floor topping by power-driven trowel without allowing blisters to develop. Continue troweling passes and restraighten until surface is smooth and uniform in texture.
    a) Finish surfaces to specified overall values of flatness, F(F) 25; and levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and levelness, F(L) 15, and measure or notify independent testing agency to permit measurement within 24 hours according to ASTM E 1155 for a randomly trafficked floor surface.
    b) Finish and measure surface so gap at any point between surface and an unleveled freestanding 10-foot-long straightedge, resting on 2 high spots and placed anywhere on the surface, does not exceed 1/4 inch. (this method is roughly equivalent to F(F) 25.

G. Construction Joints: Construct joints true to line with faces perpendicular to surface plane of concrete floor topping, at locations indicated or as approved by Architect.

1. Coat face of construction joint with epoxy adhesive at locations where concrete floor topping is placed against hardened or partially hardened concrete floor topping.

H. Contraction Joints: Form weakened-plane contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete floor topping when cutting action will not tear, abrade, or otherwise damage surface and before random contraction cracks develop.
1. Form joints in concrete floor topping over contraction joints in base slabs, unless otherwise indicated by DCAS.
2. Contractor may choose either installation method for new, hardened concrete;
3. Construct contraction joints for a combined depth equal to topping thickness and not less than one-fourth of base-slab thickness. (For monolithic floor topping placement).
4. Construct contraction joints for a depth equal to one-half of concrete floor topping thickness, but not less than 1/2 inch deep. (For deferred floor topping placement or if topping existing base slabs).

3.4 PROTECTING AND CURING

A. General: Protect freshly placed concrete floor topping from premature drying and excessive cold or hot temperatures.

B. Evaporation Retarder: Apply evaporation retarder to concrete floor topping surfaces in hot, dry, or windy conditions before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying floor topping, but before float finishing.

C. Begin curing immediately after finishing concrete floor topping. Cure by one or a combination of the following methods, according to concrete floor topping manufacturer's written instructions: Moisture curing or moisture-retaining-cover curing of iron-aggregate topping is discouraged by concrete floor topping manufacturers.
1. Moisture Curing: Keep surfaces continuously moist for not less than 7 days with water, continuous water-fog spray or [absorptive cover, water saturated and kept continuously wet. Cover topping surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in two coats in continuous operations by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.5 JOINT FILLING

A. Prepare and clean contraction joints and install semirigid joint filler, according to manufacturer's written instructions, once topping has fully cured.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth of contraction joints. Overfill joint and trim semirigid joint filler flush with top of joint after hardening.

3.6 REPAIRS

A. Defective Topping: Repair and patch defective concrete floor topping areas, including areas that have not bonded to concrete substrate.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: DCAS may request at Contractor's expense a testing agency as a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing and inspecting of completed applications of concrete floor toppings shall take place in successive stages, in areas of extent and using methods as follows:

1. Sample Sets: At point of placement, a set of 3 molded-cube samples shall be taken from the topping mix for the first 750 sq. ft., plus 1 set of samples for each subsequent 3,000 sq. ft. of topping, or fraction thereof, but not less than 6 samples for each day's placement. Samples shall be tested according to ASTM C 109/C 109M for compliance with compressive-strength requirements.
2. Concrete floor topping shall be tested for delamination by dragging a steel chain over the surface.
3. Concrete floor topping shall be tested for compliance with surface flatness and levelness tolerances.

C. DCAS can request to Contractor to remove and replace applications of concrete floor topping where test results indicate that it does not comply with specified requirements at Contractor's expense.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION 035300

SECTION 035400
CEMENT SELF LEVELING COMPOUND

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Contract Documents apply to this section.

1.2 SUMMARY

A. Section includes: Floor patching and leveling required prior to installation of floor coverings. Scope of repair work will be provided by design professional for every job.

B. Related Requirements:
2. Division 09 Section Tiling" for resilient wall base and accessories installed with carpet tile.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
1. ASTN C472 Modified – Compressive Strength of Gypsum, Gypsum Plaster, and Gypsum Concrete.
2. ASTM C348 Modified – Flexural Strength of Hydraulic Cement Mortars.
3. ASTM C307 – Tensile Strength of Chemical Resistant Mortars, Grout, and Monolithic Surfacing.
4. ASTM C266 – Time of Setting of Hydraulic Cement Paste by Gilmore Needle.
5. ASTM E1155 – Method for Determining Floor Flatness and Levelness Using the “F-Number” System.
6. ASTM F1869 – Standard Test Method for Measuring the Moisture Vapor Emissions Rate of a Concrete Subfloor.
7. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2013.
8. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

1.4 SUBMITALS

A. Product Data: Provide manufacturer’s data sheets documenting physical characteristics and product limitations of underlayment materials. Include information on surface preparation, environmental limitations, and installation instructions to prove compliance with specified requirements.

B. Sample of manufacturer’s limited warranty and warranty applications procedures.

1.5 QUALITY ASSURANCE

A. Qualifications:
1. Contractor shall be knowledgeable and well trained in the use of floor underlayment materials.

2. The product supplier shall be dependable, Skimflow High Performance.
   a. The material shall be compatible with concrete, wood, lightweight concrete, gypsum, suspended floors, metal, radiant heat tubing, and other floor substrates as required.
   b. The material shall be compatible with most floor covering adhesive, including requirements for surface alkalinity not to exceed a pH of 9.0.

B. Field Samples Applications: At location on Project selected by Architect or Engineer, perform substrate preparation work using methods proposed for Project. Notify Architect/Engineer to allow observation. Install a sample of material using similar techniques that will be used on the project. The sample size shall be 3 ft. x 3 ft. Accepted sample establishes standard for Work. Complete application when no longer needed for reference.

1.6 DELIVERY, STORAGE AND HANDLING

A. Comply with manufacturer's instructions. Deliver in original, unopen packaging keep until ready for installation.

B. Store all products in dry conditions and protect from direct sun exposure, freezing, and extreme heat (greater than 105 degrees F (41C)).

1.7 MOCK-UP

A. Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Prepare mock-up in location designated my Architect or Engineer.
   2. Area: 6 ft by 6 ft.

B. Mock-up may remail as part of the work.

1.8 FIELD CONDITIONS

A. Do not install underlayment until floor penetrations and peripheral work are completed.

B. Maintain minimum ambient temperature of 50 degrees F (10 degrees C) 24 hours before, during and 72 hours after installation of underlayment.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Subject to the requirements specified herein, provide one of the following products:
   1. "Supercap SC500" by Laticrete.
   2. "Level Set 200" by ProSpec.
   3. "DSP-520" made by H.B. Fuller Co.
   4. "Super Flo-Top" made by Euclid Chemical Co.
   5. "K-15" made by Ardex.
   6. "Ultraplan 1 Plus" by the Mapei Corp. (rapid setting).
   7. "Novoplan 2" by the Mapei Corp. (standard setting).

8. "Level Quick R/S" or "E/S" by Custom Buiding Products.
9. Or an Approved Equal

2.2 MATERIALS

A. Underlayment: One of the above listed products.

B. Water: Potable and not detrimental to underlayment mix materials.

C. Primer: Manufacturer's recommended type.

D. Joint and Crack Filler: Latex based.

2.3 MIXING

A. Site mix materials in accordance with manufacturer's instructions.

B. Mix to achieve following characteristics:
1. Density: 115 lb./cu. ft. minimum dry density.
2. Compressive Strength: 4,000 psi minimum in accordance with ASTM C 109.
3. Fire Hazard Classification: Flame/Smoke rating of 0/0 in accordance with ASTM E 286.

C. Mix to self-leveling consistency.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where cement leveling compounds are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

B. Manufacturer’s representative must inspect surfaces to receive cement leveling compound and approve those surfaces in writing to the Architect prior to start of application.

3.2 PREPARATION

A. Vacuum clean surfaces; remove any material (curing compounds, film, dirt) that would be detrimental to bond of cement leveling compound.

B. Prime substrate in accordance with manufacturer's instructions. Allow to dry.

C. Close floor openings.

3.3 APPLICATION

A. Install underlayment in accordance with manufacturer's instructions.

B. Place to minimum 1/4" thickness.

C. Transition to existing floor; use stiff mix to slope to align with existing adjacent floor.

D. If a fine, feathered edge is desired, steel trowel the edge after initial set, but before it is completely hard.

E. Pump or pour material onto substrate. Do not re-temper or add water.
   1. Pump, move, and screed while the material is still highly flowable.
   2. Be careful not to create cold joints.
   3. Wear spiked shoes while working in the wet material to avoid leaving marks

3.4 CURING

A. Air cure in accordance with manufacturer's instructions.

3.5 APPLICATION TOLERANCE

A. Top Surface: Level to 1/8 inch in 10 ft.

3.6 PROTECTION OF FINISHED WORK

A. Do not permit traffic over unprotected floor underlayment surfaces and until underlayment is completely dry.

3.7 PRECAUTIONS AND LIMITATIONS

A. Do not use over particle board, presswood, masonite, chipboard, Luaun, or similar dimensionally unstable materials, or any substrate not well bonded or free of movement.

B. Do not use where surface or air temperature falls below 50 F. (10 C.) within 72 hours before or after installation or when finished floor is subject to freeze within 7 days.

C. Do not install where hydrostatic pressure or excessive moisture emissions exceeds level permitted for floor covering to be installed.

D. Do not use as a troweled patch or at less than natural minimum flow thickness.

E. Do not use exterior.

END OF SECTION 035400

SECTION 038213
CORE DRILLING FLOOR AND WALL

PART 1- GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Core drilling.
   2. Drilling Set-up Procedures.
   3. Drilling Operation

B. Related Documents and Sections: Examine Contract Documents for requirements that directly affect or are affected by Work of this Section. A list of those Documents and Sections include, but is not limited to the following:
   1. Drawings and Contract Documents apply to this Section.
   2. Section 024119, SELECTIVE DEMOLITION.

1.2 SUBMITTALS

A. The contractor shall provide in writing a site safety protocol outlining the means, method and planning to perform the work.

1.3 QUALITY ASSURANCE

A. The contractor shall adhere to all applicable safety guidelines in accordance with Federal, State and local ordinances.

B. The contractor shall comply with ANSI B-7.1 and B-7.5 Standards.

C. The contractor shall comply with OSHA – Safety and health Standards Digest Construction Industry (OSHA) – 3149).

D. The Contractor shall verify all field conditions prior to the commencement of any work and shall notify the Construction Manager, Architect or Engineer of any issues or concerns.

E. The contractor must determine if there are utility lines contained within, adjacent to or secured to the structure being drilled. If utility lines are present as described the contractor must coordinate with other trades, Construction Manager and or Architect / Engineer to have all services cut off to these utilities.

F. The contractor shall coordinate in field all locations of cores and or cutting with Construction Manager and or Architect / Engineer prior to start of work.

G. The contractor shall provide fall protection in accordance with OSHA standard 1926.501(b)(4) for all holes and openings created by the contractor.

H. The contractor is responsible to provide protection to persons and property from potential damages on adjacent, above and below sides.

I. Provide proper disposal of slurry and wet material/debris.

J. Authorizations: Obtain written authorization from Construction Manager, Architect and or Engineer for additional cores not specified.

PART 2- DRILLING SET-UP PROCEDURE

2.1 CORE DRILLING

**Except when the cutting contractor determines if any of the following steps do not apply to a particular work or that other steps are appropriate:

A. Equipment used in the drilling operations must meet all OSHA standards and specifications as to plugs, noise, wiring, and fume pollution.

B. Specifications for minimum clearance requirements between piping and core holes is the sole responsibility of the contractor and should be determine prior to starting work.

C. The contractor shall provide labor to catch core(s) and water when the core is cut free on a suspended slab and or wall.

D. For holes, larger than 24” in diameter the contractor should provide mechanical means to remove debris from the drilling area.

E. Inspect diamond core drill bits for damage to the hub area that could cause improper seating of the back of the bit against the drill shaft.

F. Check to confirm drill bits are of proper specification for the material being cut.

G. The Contractor shall prohibit access and clear machinery or equipment directly under the area to be core drilled so that falling cores do not injure any persons or damage any property.

H. The contractor shall provide fall protection for all holes or openings created by core drilling or cutting of any floor slab.

PART 3- DRILLING OPERATION

3.1 HORIZONTAL CORE DRILLING

**Except when the cutting contractor determines if any of the following steps do not apply to a particular work or that other steps are appropriate:

A. If any of the core drilling operations are performed without water as a coolant then additional safety precautions may apply. Consult the diamond tool

manufacturer or the core drill manufacturer for specification information.

B. If any of the core drilling operations are performed with hand held core drilling equipment then additional safety precautions may apply. Consult the core drill manufacturer for specification information.

C. Never operate a core drill assembly unattended unless the equipment has been designed specifically for that purpose.

D. The core drilling equipment should be operated in accordance with the manufacturer's specifications.

E. After cores have been drilled, wipe off the surface drilled with water and allow the surface moisture to evaporate.

F. When needed, place partitions, barricades or caution tape around the work area to prevent unauthorized personnel from having access to the work area.

3.2 VERTICAL CORE DRILLING

A. Additional to the above.

B. The contractor shall use equipment that is designed to be operated vertically.

C. The contractor shall provide any design need for rigging any equipment to work as it is intended to work per manufacturer specification.

D. Any scaffolding shall be designed, provided and erected by competent personnel.

3.3 CORE EXTRACTION AND TESTING

**This test method covers obtaining, preparing, and testing cores drilled from concrete for compressive strength.

A. Contractor shall comply with ASTM code C 42, IS 516 and IS 1199.

B. Samples of hardened concrete for use in the preparation of strength test specimens shall not be taken until the concrete is strong enough to permit sample removal without disturbing the bond between the mortar and the coarse aggregates.

C. Samples that have been damaged during removal shall not be used unless the damaged portions are removed and the resulting test specimen is having the required length.

D. The diameter of the core specimen for determination of compressive strength in loadbearing structural members shall be at least 4 inches.

E. For concrete with nominal maximum size of aggregate greater than or equal to 1.5 inches, the preferred minimum core diameter shall be three times the nominal maximum size to the coarse aggregate but should be at least two times the nominal maximum size of the coarse aggregates.

F. The preferred length of the capped specimen is between 1.9 and 2.1 times the diameter.

G. High lengths can be trimmed and for specimens having low length, correction factor must be applied in compressive test.

H. Test the specimen within 7 days after coring.

I. Calculate the compressive test of the specimen using the computed cross-sectional area based on average diameter of the specimen.

J. If the L/D ratio is 1.75 or less, correct the result obtained by multiplying with correction factors as given below.

K. The value obtained after multiplying with correction factor is called corrected compressive strength, this being equivalent strength of a cylinder having L/D ratio of 2.

L. The equivalent cube strength can be calculated by multiplying the corrected cylinder strength by 5/4.

M. Report the results with the addition of the following information,
1. Length of core drilled to the nearest 5 mm.
2. Length of the specimen before and after capping to nearest 2 mm and average diameter of core to the nearest 0.2 mm or 2 mm.
3. Compressive strength to the nearest 0.1 MPa when diameter is measured to nearest 0.2 mm and to the nearest 0.5 MPa when diameter is measured to the nearest 2mm after correction for L/D ratio.
4. Direction of application of load with respect the horizontal plane of the concrete as placed
5. Moisture conditioning history
6. If water was used during end preparation, the date and time end preparation was completed and core was placed in concealed bags.
7. The date and time when tested.
8. Nominal maximum size of the aggregates.

N. Contractor must maintain proper documentation for handling, labeling, testing and chain of custody of all cores.

3.4 MEASUREMENT AND PAYMENT

A. Unit Prices- SEE BID SHEET.

B. All measurements shall be verified and signed off by the Construction manager and are all inclusive of floor assembly and wall assembly.

END OF SECTION 038213

SECTION 040100
MAINTENANCE OF MASONRY

PART 1- GENERAL

1.1 SUMMARY

A. Work Included: Provide restoration mortars in accordance with the Contract Documents. The Work of this Section shall include but not be limited to the following:
   1. Provide custom mortars for pointing existing exterior and interior brick and stone masonry.
   2. Provide custom mortars for setting existing new and salvaged exterior brick and stone masonry.

1.2 RELATED WORK

A. Division 4 Section 042113 – “Brick Masonry”

B. Division 4 Section 044300 – “Stone Masonry”

C. Division 4 Section 040140 – “Maintenance of Stone Assemblies”

D. Division 4 Section 045200 – “Masonry Cleaning”

E. Division 4 Section 042000 – “Unit Masonry”

1.3 SUMMARY

A. Section Includes:
   1. Repairing brick masonry, including replacing units.
   2. Removing abandoned anchors.
   3. Painting steel uncovered during the work.

1.4 DEFINITIONS

A. Low-Pressure Spray: 100 to 400 psi (690 to 2750 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).

B. Rebuilding (Setting) Mortar: Mortar used to set and anchor masonry in a structure, distinct from pointing mortar installed after masonry is set in place.

C. Saturation Coefficient: Ratio of the weight of water absorbed during immersion in cold water to weight absorbed during immersion in boiling water; used as an indication of resistance of masonry units to freezing and thawing.

1.5 REFERENCES

A. References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.

B. American Society for Testing and Materials (ASTM)
   1. A240 Standard Specification for Heat-Resisting Chromium and Chromium Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels.
   2. A580 Standard Specification for Stainless and Heat-Resisting Steel Wire.
   3. C67 Standard Methods of Sampling and Testing Brick and Structural Clay Tile
   4. C109 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-inch or 50 MM Cube Specimens).
   5. C126 Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units.
   6. C144 Standard Specification for Aggregate for Masonry Mortar.
   7. C150 Standard Specification for Portland Cement.
   8. C207 Standard Specification for Hydrated Lime for Masonry Purposes
   9. C270 Standard Specification for Mortar for Unit Masonry.
   10. C404 Standard Specification for Aggregates for Masonry Grout
   11. C476 Standard Specification for Grout for Reinforced and Nonreinforced Masonry.
   12. C780 Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
   13. C979 Standard Specification for Pigments for Integrally Colored Concrete

C. Brick Industry of America (BIA): BIA Technical Notes

1.6 QUALITY ASSURANCE

A. Brick Masonry Repair Specialist Qualifications: Engage an experienced brick masonry repair firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in- service performance. Experience in only installing masonry is insufficient experience for masonry repair work.
   1. Field Supervision: Brick masonry repair specialist firm shall maintain experienced full-time supervisors on Project site during times that brick masonry repair work is in progress.
   2. Brick Masonry Repair Worker Qualifications: When masonry units are being patched, assign at least one worker per crew who is trained and certified by manufacturer of patching compound to apply its products.

B. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising performance and preventing damage.

C. Mockups: Prepare mockups of brick masonry repair to demonstrate aesthetic effects and to set quality standards for materials and execution and for fabrication and installation.
   1. Masonry Repair: Prepare sample areas for each type of masonry repair work performed. If not otherwise indicated, size each mockup not smaller than two adjacent whole units or approximately 48 inches (1200 mm) in least dimension. Construct sample areas in locations in existing walls, where directed by Architect unless otherwise indicated. Demonstrate quality of materials, workmanship, and blending with existing work. Include the following as a minimum.
      - Replacement: Four brick units replaced.
      - Patching: Three small holes at least 1 inch (25 mm) in diameter as directed for each type of brick indicated to be patched.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Regulatory Requirements
   1. Building Code: Work of this Section shall conform to all requirements of the NYC Building Code and all applicable regulations of governmental authorities having jurisdiction, including safety, health, noise, and anti-pollution regulations. Where more severe requirements than those contained in the Building Code are given in this Section, the requirements of this Section shall govern.

1.7 SUBMITTALS

A. The Contractor shall submit three cured band samples of each type of mortar set in 1/2” by 6” plastic or aluminum channels for DCAS’s approval. DCAS shall approve for color and texture. In general, the Contractor shall match existing mortar unless otherwise stated.

B. The Contractor shall submit a 5-pound sample of each type of sand used.

1.8 PRODUCT HANDLING

A. Cement and lime materials, and aggregates shall be stored in such a

manner as to prevent deterioration or intrusion of foreign material.

B. Deliver materials in palletized containers, clearly labeled with manufacturer's name, address and product identification. or in heavy-duty cartons and protected against impact and chipping.

C. Store materials in original containers, protected from direct ground contact and inclement weather.

D. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

E. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

F. Store sand where grading and other required characteristics can be maintained, and contamination avoided.

G. Handle masonry units to prevent overstressing, chipping, defacement, and other damage.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Cold weather construction shall adhere to the following requirements for work, performed in ambient temperatures indicated as well as all published guidelines in "Cold Weather Masonry Construction and Protection Requirements," Brick Institute of America, latest edition. If mortar is to be mixed at air temperatures below freezing, the following procedures shall be followed:

1. 40 degrees F to 32 degrees F:
   a) Heat mixing water or sand to produce mortar between 40 degrees F and 120 degrees F and maintain above 40 degrees F until placed at that temperature.
2. 32 degrees F to 20 degrees F:
   a) Heat mixing water or sand to produce mortar between 40 degrees F and 120 degrees F. Heat grout materials so grout is maintained and placed at a temperature between 40- and 120-degrees F. Maintain mortar and grout above freezing until used in masonry.
3. 20 degrees F and below:
   a) Heat mixing water or sand to produce mortar between 40 degrees F and 120 degrees F. Heat grout materials so grout is maintained and placed at a temperature between 40- and 120-degrees F. Maintain mortar and grout above freezing until used in masonry.

PART 2 – PRODUCTS

2.1 MATERIALS

A. White Portland Cement: Type I, ASTM C 150.

B. Portland Cement Type I, ASTM C 150, non-staining. Do not use masonry cement.

C. Hydrated Lime: ASTM C 207, Type S.

D. Sand: Clean sharp sand free of loam, silt, soluble salts and organic matter, ASTM C 144.

E. Aggregate/sand shall be selected to match original mortars, where applicable or as directed.
   1. Sand for pointing mortars shall use aggregate graded with 100% passing the No. 16 sieve, as recommended for joints less than 1/4."

F. Water: Potable.

G. Oxide Pigments: Oxide pigments shall be stable, non-fading and alkali resistant.

H. Admixture for "thick set" and "thin set" mortars for setting stone dutchmen shall be Laticrete 3701 or 4237 Grout and Mortar Admixture: as manufactured by Laticrete International Inc., or an Approved Equal, used in accordance with manufacturer's written instructions.

I. Acrylic admixture for structural mortars and grouts shall be Acryl 60, as manufactured by Thoro Systems Products, Inc., Miami, FL. or an Approved Equal.

J. No additives or admixtures, other than those specified (or approved as equal) shall be used. No chlorides, or aggressive corrosive chemicals shall be used.

2.2 MORTAR MIXES

A. The mortars specified herein after shall comply with ASTM C 270, "Standard Specification for Mortar for Unit Masonry." Type "N" Mortar strength, in general, shall be consistent with a low standard deviation, and a 28-day cube compression strength of a minimum of 750 psi and a maximum of 1700 psi. Mortar mixes may change and require adjustment before and during construction in accordance with Pre-Construction Conformance Testing, Field Testing, and evaluation thereof by DCAS.
   1. Type "N" Mortar for pointing rebuilding and patching finish brick masonry:
      - 1 part by volume Portland cement (Type I)
      - 1 part by volume hydrated lime (Type S)
      - 6 parts sand (selected to match sand in original mortar)
      - Oxide pigments as needed to match original mortar color.
   2. Type "N" Mortar for pointing and rebuilding stone masonry:

- 1 part by volume white Portland cement (Type I)
- 1 part by volume hydrated lime (Type S)
- 6 parts sand (selected to match sand in original mortar)
- Oxide pigments as needed to march original mortar color.

3. Type "N" Mortar for grouting/anchoring masonry accessories, lintels; anchors, pins, frames in stone and brick masonry:
   - 1 part by volume white Portland cement (Type I)
   - 1 part by volume hydrated lime (Type S)
   - 6 parts sand (selected to match sand in original mortar)
   - Oxide pigments as needed to match original mortar color.

B. The mortars specified herein after shall comply with ASTM C 270, "Standard Specification for Mortar for Unit Masonry." Mortar mixes may change and may require adjustment before and during construction in accordance with Pre-Construction Conformance Testing, Field Testing and evaluation thereof by DCAS.

1. Mortar for slurry for pretreating masonry to be repaired:
   - 1 part by volume white Portland cement (Type I)
   - 2 parts by volume hydrated lime (Type S)
   - 6 parts fine sand
   - 1 part Acryl 60 to 5 parts water
2. "Thick Set" Mortar for setting Stone Dutchmen: "Thick Set" mortars for special conditions when the mortar bed is greater than 3/8" thick shall employ Laticrete 3701, or an Approved Equal.
   - 1 part by volume white Portland cement (Type I)
   - 3 parts fine "00" sand (selected to match color of existing clean stone)

   Temper to a workable consistency with Laticrete 3701 polymer admixture mixed in accordance with manufacturer's recommendations for a high strength, "thick set" mortar.
3. "Thin Set" Mortar for Setting Stone Dutchmen: Use when the mortar bed is less than 3/8" thick to produce an initially tacky mortar exhibiting high strength properties when set.
   - 1 part by volume white Portland cement (Type I)
   - 3 parts fine "00" sand (selected to match color of existing clean stone)

   Temper to a workable consistency with Laticrete polymer admixture mixed in accordance with manufacturer's recommendations for a high strength, "thin set" mortar.

C. Mortars for stone masonry patching including sandstone, brownstone, and brick, shall be custom-color matched patching materials specifically prepared by the manufacturer to match each cleaned existing stone, including color, texture and composition, and shall be "Jahn M70 Restoration Mortar" as manufactured by Cathedral Stone Company, or an Approved Equal.

2.3 MIXING OF MORTAR

A. Mortar ingredients shall be measured carefully so that proportions are controlled and maintained throughout all work periods.

B. Mortar shall be mixed in an approved type power operated batch mixer. Mixing time shall be such as to produce a homogeneous plastic mortar, but mixing shall not be less than five minutes, approximately two minutes of which shall be for mixing of dry materials and not less than three minutes for continuing the mixing after water has been added. A minimum amount of water shall be used to produce a workable consistency for the mortar's intended purpose.

C. Mortar for pointing shall be as dry a consistency as will produce a mortar sufficiently plastic to be worked into the joints.

D. Mortar for grouting shall be of a consistency as will readily be flowed in cracks and voids.

E. Mortar for slurry shall be of a consistency as will be brushable.

F. Where mortar or grout is required in small batches of less than a cubic yard and the Resident Engineer specifically approves in writing, mortar may be mixed by hand in clean wooden or metal boxes prepared for that purpose but not on slabs, sidewalks, etc., provided the methods of mixing and transferring the mortar are approved by DCAS.

G. After mixing, mortars for pointing or setting shall sit for 20 minutes prior to use to allow for initial shrinkage. Mortar shall be placed in final position within two hours of mixing. Re-tempering of partially hardened material is not permitted.

H. Mortar for grout shall be placed in final position within two hours of mixing. Re- tempering of partially hardened material is not permitted.

I. Custom patching materials shall be stored and mixed in strict accordance with the manufacturer's written instructions.

PART 3- EXECUTION

3.1 INSTALLATION

A. To be performed as part of the work of the following sections:
1. Section 040140 – "Maintenance of Stone Assemblies"
2. Section 042000 – "Unit Masonry"
3. Section 042113 – "Brick Masonry"
4. Section 044300 – "Stone Masonry"
5. Section 045200 – "Masonry Cleaning"

3.2 EXAMINATION

A. Examine all adjoining Work on which this Work is in anyway dependent for proper installation and workmanship. Report to the Authority any conditions that prevent the performance of this Work.

3.3 PREPARATION AND PROTECTION

A. Protection
1. Protect adjacent surfaces not being restored. Protect sills, ledges, and projections from material droppings. Also protect any painted surfaces that are not included in the Work from impact or damage.
2. Cover top of masonry wall with waterproof plastic membrane at the end of the work period and at other times when Work needs to be protected from rain and other precipitation. Extend cover down sides as needed to thoroughly protect the Work.
3. During cold weather, do not use wet masonry units and frozen masonry units.
4. Do not use frozen materials or lay masonry on frozen materials; remove frozen materials from wall. Refer to Part 1 of this Section, "Environmental Requirements" for temperature restrictions.
5. Remove excess mortar from walls as soon after laying units as practicable to prevent staining and to facilitate cleaning of wall.
6. Brace walls as needed until sufficiently set, or until intersecting walls provide lateral support.
7. Scaffolding shall not be supported from a parapet wall on which work is being performed.
8. Work on the exterior face of a parapet wall shall not be done concurrently with work on the interior face of the parapet wall.

B. Surface Preparation
1. Prepare surfaces to be restored in compliance with product manufacturer's printed instructions and as specified.
2. Remove dirt, dust, and foreign material from surfaces to be restored.
3. Clean areas to be restored with compressed air or water flushing, except as otherwise recommended by the mortar manufacturer.

C. Material Preparation
1. Do not further wet concrete masonry units and stone that are already wet.
2. Wet bricks that have a high initial absorption rate (greater than 20 g/min). Wet bricks until water runs off. Install bricks when surface is slightly damp.
3. Prepare exposed mortar to match the color and appearance of existing adjoining mortar.

3.4 MIXING PROCEDURE FOR MORTAR

A. Measure material by volume or equivalent weight. In measuring by volume, use a container to measure ingredients. Do not measure by shovel.

B. Rebuilding/Setting Mortar
   1. Mix ingredients in a clean mechanical mixer for a minimum of 3 minutes, maximum of 5, with the minimum amount of water to produce a workable consistency.
   2. Mortar that has stiffened because of evaporation of water from the mortar may be retempered only once, and only during the first hour of placement to restore the required consistency. Use mortar within 21/2 hours of its initial mixing; tempering is permitted only once and during the first hour only. Limit amount of mortar batched at one time to stay within these requirements.

C. Pointing Mortar
   1. Add sufficient water to dry mix to produce a damp mix that will retain it shape when pressed into a ball by hand. Mix from 3 to 7 min. in a mechanical mixer.
   2. Let mortar stand for not less than 1 hour nor more than 1½ hours for prehydration. Add sufficient water to bring mortar to proper consistency for tuck-pointing, somewhat drier than mortar used for laying units.
   3. Use mortar within 2½ hours of its initial mixing; tempering is permitted only once after bringing mortar to proper consistency. Limit amount of mortar batched at one time to stay within these requirements.

D. For prepackaged masonry repair mortar, mix with water or manufacturer's polymer in proportions defined by manufacturer to provide the required consistency.

3.2 REPOINTING JOINTS

A. The Contractor shall take all precautions required to ensure the original appearance of the building is maintained (not changed) and the existing brick is not damaged. The new mortar shall match the original in color & texture and the new joint shall match the existing joint tooling, size, and profile. For joints that are set back from the brick face (raked joints), provide a sloping joint starting at the original depth at the top and sloping to the brick face at the bottom that will prevent water sitting on the brick while maintaining the intended shadow line.

B. Rake or cut out joints to a minimum uniform depth of 3/4" and until sound surface is reached. Do not spall edges of masonry units or widen joints. Replace all brick damaged by such operations with new to match color, size, and texture.
   1. Mortar Removal
   2. Where cutting is required to remove existing mortar and joint filler, use a rotary power masonry saw wherever possible without

damaging masonry. Masonry saw shall have a vacuum attachment to reduce dust. Use non-power tools for vertical brick joints or where rotary power masonry saw will damage joint.

3. Cut the mortar and joint filler cleanly from the sides of the joints, leaving square corners. Flush joints clean with water or compressed air.

C. Dampen joints slightly before application of mortar, making sure there is no free water. Pack pointing mortar tightly in joints in thin layers (1/4" max.), with each layer "thumbprint hard" before applying the next layer. Tool joints to match existing adjoining joints.

1. Where joint sealant is required, backpack the joints tightly out to a uniform depth of 1/4", or as indicated on Drawings. Refer to Section 079200 for sealants. Apply bond breaker tape prior to installing sealants.

D. Cure mortar by maintaining in a damp condition for at least 72 hours.

3.5 REPLACING MASONRY UNITS

A. The Contractor is responsible for performing Work in a safe manner. Provide temporary shoring or other supports as required to prevent displacement of existing masonry that is to remain. Perform the removal Work with such care as may be required to prevent failure of the masonry or damage to adjoining masonry that is to remain. Follow method of operation and/ or bracing scheme required to be provided in Article 1.04 titled "Submittals".

B. Remove the deteriorated and damaged masonry units to their full depth, including the surrounding joint mortar. Wet masonry to reduce dust. Install helical masonry ties at perimeter of replacement prior to removal as indicated in detail on the Drawings. Wherever possible without damaging masonry, use a rotary power masonry saw for cutting Work. Masonry saw shall have a vacuum attachment to reduce dust. For SHPO designated/landmark buildings, removal of perimeter brick in the area designated for removal shall be done by first cutting the joint utilizing methods specified in Art. 3.04, B.,2. Leave square corners at adjoining masonry that is to remain. Clean joints and cavities by flushing with water or compressed air.

C. Dampen contact surfaces slightly before application of mortar, making sure there is no free water. Install matching masonry units with Type N mortar. Install units to match and align with existing masonry. Maintain bonding and coursing pattern of existing masonry. Use presoaked wood wedges where necessary to properly set the units and maintain uniform matching joints. Backpack and fill joints full of mortar. Finish joints to match existing adjoining joints as described in Art. 3.04- Repointing Joints. Fill open joints in backup. In solid masonry construction, ensure that entire collar joint is filled between the backup and the face masonry.

Collar joint is likely to vary substantially, up to 3” in locations.

D. Install accessories as indicated on Drawings. In cavity wall construction provide mortar mesh directly on flashing, such as at base of wall, and at relieving angles and lintels, with flashing extending at least 6” above top of mortar mesh.

E. Area Face Brick Replacement
1. Single wythes of brick shall be replaced in 4-foot lengths maximum unless indicated otherwise by the "methods of operation" submitted by the Contractor's Engineer.
2. Install reinforcement every 16" each way and secure it to backup masonry as indicated on Drawings.

F. Replacement by Brick Stitching
1. Remove and replace existing brick to their full depth with new face brick, one brick each on both sides of crack in masonry. Also, remove and replace all existing pushed- out, missing, split or otherwise defective face bricks to match the adjoining existing good sound masonry. If the existing masonry work has a solid masonry common- bond pattern, existing sound header bricks shall remain. However, any cracked, defective, or loose header brick shall be replaced. All new brick work shall be toothed into existing good work. At horizontal and diagonal cracks, the replacement of bricks shall be done in 4-foot lengths maximum unless indicated otherwise by the "methods of operation" submitted by the Contractor's Engineer. Existing mortar bed for replaced brick shall be thoroughly removed and the back parged with a coat of new mortar to fill the collar joint.

3.6 STABILIZATION OF EXISTING MASONRY WALLS

A. The existing face masonry shall be stabilized to the backup material by means of helical masonry ties. The installation and procedure shall be inspected by DCAS’s Representative and the Company Field Representative to verify proper installation of the helical ties.

B. Prior to start of the Work, the existing conditions shall be examined by a Company Field Representative (CFR) authorized in writing by the manufacturer of the helical The CFR shall instruct the Contractor in the installation of the ties. The CFR shall recommend the diameter, length, type, and spacing of ties and drill bits to be used at each location and masonry condition, based on tests described in paragraph C., below. The CFR shall submit this information in written or graphic form, through the Contractor, to DCAS for review and approval by the Architect or Engineer of Record.

C. The design spacing of the ties shall typically be 16" vertically and 16" horizontally. Spacing shall be closer where required because of existing

conditions, and where pull- out load tests show it to be necessary. Pull-out tests shall be performed at each masonry condition by the CFR prior to the start of the Work, and the results of the tests shall be submitted to the Authority. Separate pull-out tests shall be performed on the face masonry, mortar joints and on the backup material. For tie spacing of 16" x 16" a load of 300 lbs. shall be achieved for the face masonry and for the backup material separately, without failure by loss of resistance or slippage. Where a 500 lbs. test load is achieved for each material separately, it will be permissible to increase spacing of ties to 16" x 24".

D. A pilot hole shall be drilled through the face masonry and into the backup material using a high-speed rotary percussion drill (Bosch model 1194VSR, or an Approved Equal), 3-jaw chuck type. If acceptable pullout results are achieved through the mortar joints, this shall be the preferred method of installation of the ties rather than through the face masonry, particularly for SHPO eligible buildings. At certain conditions, as recommended by the CFR, the drill bit used for the face masonry shall be of different diameter than the bit used in the backup material. The helical tie shall be driven into position using an electric hammer drill with SDS type chuck and specialized insertion tool. The electric hammer drill with SDS type chuck shall not be used for drilling pilot holes in face masonry. The electric hammer drill with SDS type chuck shall only be used for drilling pilot holes in backup material when recommended by the manufacturer such as in concrete.

E. Each wall condition shall be examined by the Architect or Engineer of Record and the CFR to determine specific installation requirements. The following is presented as an example of a 10mm diameter tie in face brick with concrete block backup. The installation shall be performed in the following manner, subject to actual project conditions and modification by the CFR:

1. For use of 10 mm helical ties, drill an 8mm-entry\ hole through face brick using high speed rotary percussion drill. (Where location is a mortar joint, drill a 6.5mm hole near the approximate center point of the brick, not at T- joints or ends).
2. Change bits and drill a 6.5mm entry hole through the concrete block backup to a minimum of 3 inches, using high-speed rotary percussion drill.
3. Drive helical tie into place, recessed for final patching, using a setting tool mounted on an electric hammer drill with an SDS type chuck.

3.7 FIELD QUALITY CONTROL

A. DCAS will assign under the requirements of Section BC 1704.5 a Special Inspector who will inspect the masonry construction. If the masonry work is not designated for Special Inspection, the masonry work will be subject to Quality Control Inspection, with testing and inspection similar to that listed below for Special Inspection. Inspections performed by the Authority do not relieve the Contractor of its obligation to conform to all

requirements specified in this Section.

B. The Special Inspector will make inspections, and any testing deemed necessary. Mortar suspected or tested to be too strong or too weak will be subject to petrographic analysis or other methods deemed necessary by the Engineer of Record and Special Inspector. The Contractor shall pay for all tests if they verify improper work. Inspections will include, but not be limited to, the following:
   1. Proper installation of reinforcement of brick on angles.
   2. Proper depth of mortar cutting for pointing.
   3. Proper installation of mortar, including proportioning and mixing. Those mortar properties listed in the Appendix of ASTM C780 are to be tested at the discretion of the Special Inspector or the Architect/Engineer of Record Mortar strengths, when tested, will be determined in accordance with ASTM C780 using cylinders.
   4. Proper installation of weeps, flashing, drip edges, mortar mesh, cleaning of cavity (if cavity wall construction), etc.
   5. At solid masonry construction, all bed, head, and collar joints are filled completely for cavity wall construction, all bed and head joints are filled completely.

C. The Architect or Engineer of Record will analyze any results not found to be in conformance with the applicable ASTM, industry practice, and the Specifications and determine if the masonry in question is to be removed and redone.

D. Cooperate with the Special Inspector and the Testing Laboratory performing Special Inspection testing.

E. The Contractor's engineer shall monitor the restoration procedure to ensure compliance with the "methods of operation" and to ensure safety of the structure.

3.8 PROTECTION AND CLEANING

A. Protect face of adjacent walls and surfaces from water, mortar, and grout used for terra cotta installation.
B. Remove excess mortar and mortar smears as work progresses.
C. After mortar has cured (a minimum of 30 days), clean soiled surfaces with detergent and clean water. Use fiber brushes and cloths. Do not use metallic tools or acids.
D. Perform a mock-up of the cleaning procedure

3.9 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

END OF SECTION 040100

SECTION 040140
MAINTENANCE OF STONE ASSEMBLIES

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes maintenance of stone assemblies consisting of stone restoration and cleaning as follows:
   1. Unused anchor removal.
   2. Repairing stone masonry, including but not limited to, replacing whole and partial units.
   3. Painting steel uncovered during the work.
   4. Repointing joints.
   5. Preliminary cleaning, including removing plant growth.
   6. Cleaning exposed stone surfaces.
   7. Stone consolidation treatment.

Related Sections:
1. Division 4 Section “Maintenance of Masonry”
2. Division 4 Section “Unit Masonry”
3. Division 4 Section “Brick Masonry”
4. Division 4 Section “Stone Masonry”
5. Division 4 Section “Masonry Cleaning”

1.2 QUALITY ASSURANCE

A. All work shall be performed by skilled workers. The Contractor or sub-contractor performing the work of this section must have recently completed masonry pointing projects similar in scope, materials, and extent to those indicated by this section, and whose work has resulted in construction with a record of successful in-service performance (i.e. masonry pointing on buildings that are landmark, landmark quality or buildings of equivalent historical or architectural significance).

B. Source of Materials: Obtain materials for masonry restoration from a single source for each type of material required to ensure a match in quality, color and texture.

C. Field Supervised Construction: The Contractor shall notify DCAS before beginning masonry restoration and obtain DCAS’s approval of the installation of restored masonry before proceeding with the remainder of the work.

D. The Contractor shall replace all broken, lost and damaged masonry resulting from repair, removal, transportation, cleaning or storing at no expense to the City.

E. In acceptance or rejection of this work, no account shall be taken for incompetence or lack of skill on the part of the workmen.

F. The Contractor shall maintain a steady work crew consisting of skilled craftsmen, who are experienced with the materials and methods specified and familiar with the design requirements, and a full-time foreman. The Contractor shall confirm that all workmen under its direction fully understand the requirements of the job.
   1. Stonework shall be executed by skilled mechanics, thoroughly trained and familiar with the methods required. Skilled stone fitters shall be employed at the site to do necessary field cutting.

G. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging stonework. Include provisions for supervising performance and preventing damage.

1.3 SUBMITTALS

A. Program of Work: Submit a written program for each restoration phase of this Contract, include protection of surrounding materials on the building and site, and adjoining properties, during operations.
   1. Include detailed description of materials, methods, and equipment to be used for each phase of the work of the Contract.
   2. Include written descriptions, drawings, and diagrams, outlining proposed methods and procedures for protection of personnel, the public, and the existing construction during the Work of this Section.
   3. If alternate methods and materials to those specified are proposed for any phase of the restoration work, provide written description. Provide evidence of successful use on comparable projects and demonstrate its effectiveness for use on this project.

B. Product Literature: The Contractor shall submit three (3) copies of the manufacturer's technical data for each product including their recommendations for application and use. Include test report and certificates that verify the product's compliance with the specification's requirements.

C. Shop Drawings:
   1. Submit complete shop drawings of all cut stonework to DCAS for his approval. These drawings, when viewed, together, shall show all details of bedding, bonding, jointing; anchoring and other essential aspects of the work; in addition, the finish, dimensions and setting number of each piece of stone shall be shown.
   2. The Contractor shall be responsible, for all field measurements and the preparation of setting drawings fully defining the conditions for the installation of all stone masonry and dutchman repairs. The Contractor shall review, approve, and countersign the setting

drawings prior to their submission to DCAS.

3. The cut stone fabricator shall prepare all shop drawings, fully defining the conditions for fabricating, finishing and fastening all cut stone and dutchman.

D. Samples**:**

1. Submit sufficient sets of three (3) 12" x 12" samples of cut stone for dutchman to show the full range of color, texture, and finish proposed for the work. Upon approval by DCAS, one (1) full set shall be returned to the Contractor for his use as a reference standard during the conduct of the work. This set shall be kept on the job site for easy reference throughout the course of construction.
2. Submit samples of all attachments, anchors, inserts, and fastening.
3. Submit copies of all manufacturers' printed materials and instructions, and material safety data sheets (MSDS).

1.4 MOCK-UPS

A. Mockup Panels:

1. Submit mockup panels for DCAS's approval. Resubmit panels until DCAS is fully satisfied. Mockup panels shall be prepared by the Contractor using the same workmen, methods and materials that will be employed for the remainder of the work. At the discretion of DCAS, mockups shall be prepared in the presence of DCAS.
2. Prepare the following mockup panels, in locations selected by DCAS.
   a. Dutchman stone repair. Panel shall be no less than 2 square feet, and shall, at the discretion of the Resident Engineer contain one or more dutchman.
   b. Stone patch using custom patching mortar, minimum twelve square inches.
3. Contractor shall protect approved mockup panels for the duration of the work. Approved mockups shall constitute a standard for approving subsequent work.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Work shall not be permitted in freezing weather, or when temperature of the air or wall is expected to freeze within 48 hours of work. The Contractor shall take all necessary precautions to protect the building and materials from freezing during treatment. No work shall begin when any part of the Wall, or materials in use are frozen, or subject to freezing temperatures.

B. Protect completed masonry and adjacent masonry to be pointed in the following manner. Temperature ranges indicated apply to mean daily air temperatures except for grouted masonry. For grouted masonry temperature ranges the following apply to anticipated minimum night temperatures:

1. 40° F to 32° F:

a. Protect masonry from rain or snow for at least 24 hours by covering with weather- resistive membrane.

2. 32° F to 20° F:
   a. Completely cover masonry with weather-resistive insulating blankets or similar protection for at least 24 hours, 48 hours for grouted masonry.
3. 20° F and below:
   a. Except as otherwise indicated, maintain masonry temperature above 32° F for 24 hours using enclosures and supplementary heat electric heating blankets, infrared lamps or other methods proven to be satisfactory. For grouted masonry maintain heated enclosure to 40° F for 48 hours.

C. Cold weather construction shall adhere to the published guidelines in "Cold Weather Masonry Construction and Protection Requirements." Brick Institute of America, latest edition.

D. Materials shall be used only at the manufacturer's recommended temperature tolerances for masonry materials.

E. The work shall be protected during hot weather from premature or rapid curing by the use of dampened fabric coverings.

1.6 DEFINITIONS

A. As used here the term "dutchman" refers to any new or salvaged stone fitted into the existing façade stone.

B. "Stone-to-Stone" repairs refer to conditions where the original stone piece still exists and can be pinned directly back into its original location or to its mated portion.

C. As used here "plug" refers to a circular dutchman drilled out of existing stone.

D. Low-Pressure Spray: 100 to 400 psi (690 to 2750 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).

E. Rebuilding (Setting) Mortar: Mortar used to set and anchor masonry in a structure, distinct from pointing mortar installed after masonry is set in place.

F. Rift: The most pronounced direction of splitting or cleavage of a stone.

G. Stone Terminology: ASTM C 119.

1.7 SEQUENCING AND SCHEDULING

A. Order sand and gray Portland cement for colored mortar immediately after

approval of Samples and mockups. Take delivery of and store at Project site enough quantity to complete Project.

B. Work Sequence: Perform stone repair work in the following sequence, which includes work specified in this and other Sections.
   1. Remove plant growth.
   2. Inspect masonry for open mortar joints and permanently or temporarily point them before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
   3. Remove paint.
   4. Clean stone.
   5. Rake out mortar from joints surrounding stone to be replaced and from joints adjacent to stone repairs along joints.
   6. Repair stonework, including replacing existing stone with new stone.
   7. Rake out mortar from joints to be repointed.
   8. Point mortar and sealant joints.
   9. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
   10. Where water repellents are to be used on or near stonework, delay application of these chemicals until after pointing and cleaning.

C. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in stone according to "Stone Patching" Article.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver stone units to Project site strapped together in suitable packs or pallets or in heavy-duty crates and protected against impact and chipping.

B. Deliver each piece of stone with code mark or setting number on unexposed face, corresponding to Shop Drawings, using nonstaining paint.

C. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

D. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

E. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

F. Store sand where grading and other required characteristics can be maintained, and contamination avoided.

G. Handle stone to prevent overstressing, chipping, defacement, and other damage.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit stone repair work to be performed according to product manufacturers' written instructions and specified requirements.

B. Temperature Limits, General: Repair stone units only when air temperature is between 40 and 90 deg F (4 and 32 deg C) and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.

C. Cold-Weather Requirements: Comply with the following procedures for stone repair unless otherwise indicated.
   1. When air temperature is below 40 deg F (4 deg C), heat mortar ingredients, repair materials, and existing stone to produce temperatures between 40 and 120 deg F (4 and 49 deg C).
   2. When mean daily air temperature is below 40 deg F (4 deg C), provide enclosure and heat to maintain temperatures above 32 deg F (0 deg C) within the enclosure for seven days after repair.

D. Hot-Weather Requirements: Protect stone repairs when temperature and humidity conditions produce excessive evaporation of water from mortar and patching materials. Provide artificial shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F (32 deg C) and above unless otherwise indicated.

E. For manufactured repair materials, perform work within the environmental limits set by each manufacturer

PART 2 – PRODUCTS

2.1 MATERIALS

A. Provide new stone for dutchman to match existing stone in color and texture. All exposed surfaces shall have finish to match existing. Ends and planes shall be square, dressed uniformly, and free of projections, mars, chips, or depressions.
   1. Limestone shall be Indiana Limestone, Select Grade, ASTM C-568, or an Approved Equal. Fabrication shall comply with recommendations of the Indiana Limestone Institute of America.
   2. Marble shall comply with the requirements of ASTM C-503. Fabrication shall comply with recommendations of the Marble Institute of America, Inc. (MIA) as published in “Dimension Stone Design Manual III.”
   3. Granite shall comply with requirements of ASTM C-615, Architectural Grade, and National Building Granite Quarries

Association, Inc. for color and finish qualities.

B. Anchors and Fastenings for Stone Masonry:
   1. Anchors and fastenings shall be stainless steel Type 302 or 304.
   2. Expansion bolts, cinch bolts and plugs shall not be acceptable.

C. Detergent: Non-ionic type, “KRC Ion 417,” manufactured by Chemique, Inc., Moorestown, NJ, 08057, or an Approved Equal.

D. Mortar:
   1. Lex-modified mortar materials for “thin set” and “thick set” setting of stone dutchman shall conform to the Materials and Mixtures specified in Section 042000.

E. Patching Material:
   1. Mortar for patching limestone shall be custom-matched patching materials specifically prepared by the manufacturer to match the existing cleaned masonry color, texture and composition, and shall be “Jahn restoration mortar M70” as manufactured by Cathedral Stone, 2505 Reed Street, N.E., Washington, D.C. 200l5, (202) 832-1135, or an Approved Equal.
   2. Patching material for Marble: 2-component Akemi Knife Grade Polyester adhesive, manufactured by Akemi Plastics, Inc., Eaton Rapids, MI., or an Approved Equal.

F. Adhesive for attaching anchors: high modulus, high strength, moisture insensitive, epoxy adhesive. Adhesive shall be two-component 100% solids, epoxy resin system with a viscosity similar to petroleum jelly, such as Sikadur Hi-Mod Gel, as manufactured by Sika Corporation. Lyndhurst, NJ, (201) 933-8800 or an Approved Equal.

G. Adhesive for stone-to-stone repairs and crack injection: high modulus, high strength, moisture insensitive, low viscosity epoxy adhesive complying with ASTM C881-90, Types I, II, III, IV, & V, Grade I. Provide Sikadur 35 Hi-Mod LV, as manufactured by Sika Corporation, Lyndhurst, NJ, (201) 933-8800, or an Approved Equal.

H. Threaded rod for masonry patching: 3/8” minimum diameter threaded Teflon rod.

I. Anchors for face pinning: Minimum 3/8” diameter threaded stainless steel adhesive anchors with screen tubes. Provide Hilti HIT HYISO anchors as manufactured by Hilti Corp, or an Approved Equal:

PART 3 – EXECUTION

3.1 GENERAL:

A. The Contractor shall be fully responsible for the proper execution and

performance of the work described herein. It shall be the Contractor's responsibility to inspect all surface conditions and correct any conditions, which may affect his work adversely. Stonework shall be executed by skilled mechanics, thoroughly trained and familiar with the methods required. Skilled stone fitters shall be employed at the site to do necessary field cutting.

B. All treatments, including the installation of dutchman, new incisions into the stone, etc. shall have a minimum visual impact in the interest of preserving as much existing stone as possible.

C. As related to the work of this Contract, areas to be patched with natural stone dutchman include severely spalled "locations, and stone that would visually detract or otherwise be unacceptable if left unrepaired.

3.2 SETTING STONE DUTCHMAN

A. Use Laticrete 3701 to produce high strength "thick set" mortar, or an Approved Equal. Stone must be temporarily held in place with nylon wedges or other means until the mortar has sufficiently set.

B. "Thin set" mortars for special conditions shall employ Laticrete 4237, or an Approved Equal. Use "thin set" mortar when the mortar bed is less than 3/8" thick to produce an initially tacky mortar exhibiting high strength properties when set.

C. Provide a minimum of two (2) metal attachments for setting each stone dutchman:
   1. All wire, pins, anchors, and bars shall be stainless steel, Type 302 and 304.
      a. 1/8" diameter round stock, stainless steel wire with turned up ends for small veneers.
      b. 1/4" or 3/8" diameter round stock; stainless steel rod for direct pinning and drop dowels.
      c. 1" wide, 1/8" thick, stainless steel, flat strap anchors for larger panels.
   2. The quantity of individual attachments shall not be less than two attachments for each dutchman, and one additional attachment for every two square feet.
   3. All attachments shall be fastened by mechanical locking, in addition to appropriate adhesives and mortars.

D. Adhesives for attaching anchors and for direct pinning:
   1. Where permitted, anchors may be held in place with high modulus, high strength, moisture insensitive, epoxy adhesive, as specified.

E. General Method for Dutchman Repair of Stone:
   1. All replacement stone for the restoration of all defects indicated on the contract drawings, shall be new stone. These repairs involving

"new" material (referred to as "dutchman") shall vary in overall size but shall not be less than 3" thick under any circumstance. New stone shall be carefully cut and selected to be sound and in good condition, free of defects, cracks, breaks, or other observable defects.

2. Dutchman shall be fastened with stainless steel wire, pins, and anchors, as necessary, designed to facilitate mechanical locking and to prevent possible slippage of the stone. The metal fasteners shall be positioned without weakening the stone in any way.
3. Cement mortar containing "Laticrete" latex emulsion additives, or an Approved Equal, shall be used for all setting purposes. All insertions shall be fully dressed on all sides, and carefully fitted to the patch opening, with an allowance of not more than 1/8" buttered joint between front edges. Undercutting shall not weaken the stone in any way. The joints between new and old work shall be finished to match the color and texture of the stone.
4. The surface of the new stone shall be dressed to resemble the appearance, tooling and texture of the adjoining stone by an approved method. All surface dressing of new work shall be done before the stone is set.
5. Protect the adjacent materials during the process of stone restoration. Wipe and rinse any mortar accidentally splashed onto adjacent surfaces immediately. Clean uncured epoxy adhesive immediately with acetone.
    a. Any damage to stone or materials to remain resulting from epoxy and mortar spills shall be restored to the full satisfaction of the Resident Engineer at no additional cost to the City.
6. The face of all new stone patches shall be cleaned following the completion of all setting work. Clean mortar splashes, smears, etc. with scrapers, or by vigorously brushing with stiff natural bristle brushes and potable water. If necessary, clean white sand may be added to the water. Cleaning shall start at the top of the structure and proceed downward.

3.3. STONE-TO-STONE REPAIRS

A. The re-attachment of broken or loose stone sections using a concealed repair is preferable to the fabrication of new stone pieces.

B. To execute a concealed repair the following procedure shall be used. Holes shall be drilled into the fractured inner surface of each of the 2 pieces of stone to be reunited. The pieces shall be then fastened with stainless steel dowels embedded in epoxy adhesive, which shall be applied to both faces of the break. Only in situations involving the detachment of a very shallow fragment shall simple adhesive repair be acceptable.

C. Particular care must be taken to ensure that all edges of the stone are perfectly aligned when marking out dowel holes.

3.4 STONE PATCHING

A. REMOVAL OF MATERIAL:
   1. Examine limestone blocks for deteriorated areas. During this examination, consult DCAS whose opinion about removal of deteriorated stone will be final and accepted as such.
   2. Remove deteriorated Stone to the minimum depth necessary to reach sound material or substrate, or 1/2 inch, whichever is greater. Exercise care that sound masonry is not damaged or disturbed. Chipping of edges will not be permitted.
   3. Cut edges of areas where stone has been removed straight and parallel or perpendicular to the joints in the facade.
   4. Where the surface of the damaged stone is greater than 3/8" behind the plane of the adjacent block, slightly undercut the edges of the area to be patched to provide a slight dovetail. The rear surface of any flat area to be repaired shall be drilled with 1/2" diameter holes 1/2" deep spaced 2" to 3" apart in staggered rows to allow for mechanical bond of the patch. Vary the angles of these holes. Brush clean the areas to be patched.

B. ADDITIONAL MECHANICAL BOND FOR DEEP PATCHES
   1. If the surface of the sound stone is more than 2" below the plane of the facade drill additional holes 1" deep by 1/8" larger in diameter than the rods, 5" on center horizontally and vertically (one for every 25 square inches of surface to be patched).
   2. Anchor threaded Teflon rods' or an Approved Equal, in holes with epoxy gel. Rods should extend to a point 1" behind the surface of the finish patch.

C. PREPARATION**:**
   1. Clean surfaces to be patched and filled so that they are free from all dust, dirt, oils, grease, and other substances or coatings that might in any way affect the adhesion of the filling and patching material.
   2. Protect surrounding surfaces by all means necessary to keep them free from patching materials. Brush masonry to be patched with stiff natural bristle brushes and compressed air to make certain that all loose materials have been removed.

D. APPLICATION:
   1. Preparation: Clean and prepare all areas to be patched as specified above.
   2. Wetting: Wash surface of the prepared stone with clean, clear water and non- ferrous soft bristle brushes to remove all traces of oil, grease, scaling, dirt, dust, and friable material. The surface must be rewet prior the application of each coal.
   3. Application of Patching Mortar: Repair involves a built-up system consisting of a thin slurry coat, several scratch coats (the number to be determined by the depth of the area to be patched), and a finish coat. Proceed as follows:
      a. Apply thin Slurry Coat With a brush and rub vigorously into

the surface.

b. Press first Scratch Coat into the slurry coat while the slurry coat is still moist. Score or punch this new surface before initial drying to provide a key for subsequent scratch coats or finish coat. No coat shall exceed 3/8," in thickness. Approximately two to four hours should be allowed for initial cure of scratch coat before the succeeding scratch or finish coat is applied. The surface must be rewet prior to the application of each coat.

c. Apply the Finish Coat once the patch has received sufficient scratch coats to leave less than 3/8" to line of desired finish surface. Carefully match the original profile and texture.

d. Curing: During application of each coat, control premature drying and subsequent cracking by misting the application with water. Care shall be taken to keep the mist very gentle so that it does not wash any of the binder from the mixture.

e. Patch Depth: The depth of the patch shall be a minimum of 3/8" at its thinnest point. No feather edges or skim coats of patching material shall be permitted. If any patch is determined to be less than 3/8", it shall be cut out, and a new patch applied in accordance with these specifications at no additional cost to the City.

4. Finishing: After the patch is partially cured to leather hardness, it may be dry troweled, or damp sponged to give it a finish approximating as closely as possible that of the original stone. Alternately, after the patch is completely cured, it may be honed with dry and wet abrasive stones to achieve the desired finish. Samples of the different finishes shall be prepared for DCAS's approval before any patching is begun. The patching shall not begin until DCAS has given his written approval of the finishes and the methods used to achieve them.

5. Unacceptable Conditions: Separation at the edges of the patch and hairline cracking will not be acceptable. Unacceptable patches will be removed and refilled as directed at the contractor's expense.

6. Remove any excess patching material or dirt from all masonry surfaces and leave all surfaces uniformly clean with no streaks or stains.

E. CORRECTIVE MEASURES:

1. Should any cracks occur on the surface of the patch, cut out the patch and reapply following the requirements of these specifications to the satisfaction of DCAS, at no extra cost to the City.

2. Should DCAS determine that any of the work does not equal or exceed the minimum standard established by the approved test area; the Contractor shall cut out the patch and reapply following the requirements of these specifications to the satisfaction of DCAS.

3.5 CLEANING

A. The face of all cut stonework shall be thoroughly cleaned after completion of the setting and other work liable to damage or soil the stone. The stonework shall be gone over and any mortar splashes, or smears, and any other encrusted matter carefully removed from the surface by scrapers or carborundum bricks and any indurated discoloration from soot or other causes where such soiling occurs shall be removed, leaving the stone in condition for a thorough cleaning.

B. The cleaning shall be done with non-ionic detergent and clean water applied vigorously with fiber brushes. After cleaning, the stone shall be drenched with clear water.

C. The cleaning operation shall start at the top of the structure and proceed downward.

D. This cleaning shall be in addition to the Masonry Cleaning specified in Section 045200.

E. After mortar has fully hardened, thoroughly clean exposed stone surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, applied by low-pressure spray.
   1. Do not use metal scrapers or brushes.
   2. Do not use acidic or alkaline cleaners.

F. Clean adjacent nonstone surfaces. Use detergent and soft brushes or cloths

G. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

H. Remove masking materials, leaving no residues that could trap dirt.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.

B. Architect's Project Representatives: Architect will assign Project representatives to help carry out Architect's responsibilities at the site, including observing progress and quality of portion of the Work completed. Allow Architect's Project representatives use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.

C. Notify inspectors and Architect's Project representatives in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until inspectors and Architect's Project representatives have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

3.7 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

END OF SECTION 040140

SECTION 042000
UNIT MASONRY

PART 1 GENERAL

1.1 SUMMARY

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. The Work of this Section includes all labor, materials, equipment, and services necessary to complete the unit masonry work as shown on the drawings and/ or specified herein, including but not necessarily limited to the following:
   1. Concrete block walls and partitions.
   2. Glazed concrete masonry units.
   3. Reinforced unit masonry.
   4. Metal joint reinforcing, anchors, ties, weeps, closures, and related accessories for masonry.
   5. Control and expansion joints in masonry, filled with joint fillers.
   6. Chases, recesses, pockets, and openings in masonry as required for installation of work by others.
   7. Building in of items furnished by others into masonry, including access doors, door frames, anchors, sleeves and inserts, and other similar items to be embedded in masonry.
   8. Grouting in of metal items built into masonry work.
   9. Protection, pointing and cleaning of masonry.

1.3 RELATED SECTIONS

A. Division 7 Section “Joint Sealants” for sealing joint in mockup

B. Division 7 Section “Penetration Firestopping”.

1.4 REFERENCES

A. General: Comply with the applicable provisions and recommendations of the referenced standards except as modified by governing codes and by the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
   1. American Concrete Institute (ACI):
      a. ACI 530.1/ASCE 6/TMS602 "Specifications for Masonry Structures".
      b. ACI 216.1/TMS 216 "Code Requirements for Determining Fire Resistance of Concrete and Masonry Construction Assemblies”.
   2. National Concrete Masonry Association (NCMA): "TEK" Information Series”:
   3. American Society for Testing and Materials (ASTM):
      a. ASTM C90 “Standard Specification for Loadbearing Concrete Masonry Units”.

b. ASTM C331 “Standard Specification for Lightweight Aggregates for Concrete Masonry Units”
c. ASTM C33 “Standard Specification for Concrete Aggregates”
d. ASTM C1586 “Standard Guide for Quality Assurance of Mortars”.

1.5 SYSTEM DESCRIPTION

A. Performance Requirements: For information only. Reinforcing bar schedule and locations are shown on the drawings.
   1. Load and Deflection Criteria
      a. Construct interior unit masonry walls to withstand a lateral loading of minimum 5 psf positive and negative pressure, except where more stringent requirements are indicated.
      b. Walls of Air Plenum Shafts: Minimum 10 psf loading.

1.6 SUBMITTALS

A. Product data for each different masonry unit, accessory, and other manufactured product specified, including but not limited to:
   1. Mortar materials, each material and mortar type.
   2. Certification of mortar mix.
   3. Flashing material, descriptive literature.
   4. Concrete block, joint reinforcing, anchors, ties and joint filler; submit manufacturer's technical and descriptive literature.
   5. Block manufacturer shall submit certifications of compliance with ASTM C 90, C 331 and UL 618 prior to any job site delivery. Field sampling of concrete block may be tested by an Independent Testing Laboratory retained by the Owner according to the requirements of ASTM C 140.

B. Submit Shop Drawings for the following:
   1. Reinforcing detailing fabrication, bending, and placement of unit masonry reinforcing bars. Comply with ACI 315 “Details and Detailing of Concrete Reinforcement” showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of masonry reinforcement.
   2. Anchoring details.
   3. Control and expansion joint locations and details.

C. Submit Samples for the following:
   1. Joint reinforcing, each type, width and proposed location (labeled).
   2. Anchors, wedges and ties, each type, width and proposed location (labeled).
   3. Joint filler, each type.

D. Quality Control Submittals: Submit the following, for Consultant’s information.
   1. Test Reports:
      a. Preconstruction and field test reports for mortar indicating conformance of mortar materials to property specifications of ASTM C270.
      b. Test reports, per ASTM C780, for mortar mixes required to comply with property specification.
      c. Preconstruction and field test reports of grout in conformance with ASTM C1019.

d. Independent laboratory test reports for seismic reinforcement accessories

2. Certificates
   a. Document Review: Before commencing work, submit a written statement signed by the Subcontractor and the Applicator certifying that the Contract Documents, shop drawings and product data have been reviewed with material manufacturers qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.
   b. Material certificates for the following, signed by manufacturer and Contractor, certifying that each material complies with requirements.
      1). Each different cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
      2). Each material and grade indicated for reinforcing bars.
      3). Each type and size of joint reinforcement.
      4). Each type and size of anchors, ties, and metal accessories
   c. Producer’s Certificates
      1). Submit concrete masonry unit(s) producer's certificates, from an independent testing laboratory, stating concrete unit masonry comply with UL 618 or NCMA TEK 7-1A for two (2) hour or better (as required) referencing full scale fire test reports in conformance with ASTM E119.
      2). Mill Certificates: Submit steel producer's certificates of mill analysis, tensile and bend tests for reinforcement steel.
3. Procedures: Submit, for Consultant’s information, hot and cold-weather construction procedures evidencing compliance with requirements specified in referenced unit masonry standard ACI 530.1/ASCE 6 "Specifications for Masonry Structures".
4. Procedures and materials for cleaning masonry work; including certification that cleaner will not adversely affect stone, gaskets, sealants, etc.

1.7 QUALITY ASSURANCE

A. Basis of Design: When manufacturers’ materials, products or processes are specified for an item of Work, any one thereof is acceptable for the Subcontractor to choose. An alternative material, product or process will be considered if the Subcontractor submits a written substitution request together with such information as may be necessary to assist the Consultant in determining whether the proposed substitution is acceptable, the burden of proof rests solely upon the Subcontractor.

B. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

C. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one source and by a single manufacturer for each different product required.

D. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

E. Conform to the following non-cumulative tolerances (any masonry work not meeting these standards shall be re-built as directed by the Architect).
   1. Variation from the plumb:
      a. In lines and surfaces of columns, walls and arrises:
         1). In 10 feet 1/8"
      b. For external corners, expansion joints and other conspicuous lines:
         1). In 20 feet 1/4"
      c. For vertical alignment of head joints, do not exceed plus or minus 1/4 inch in 10 feet, nor 1/2 inch maximum.
   2. Variation from the level or the grades indicated on the drawings;
      a. for exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines:
         1). In any bay or 20 feet maximum 1/4"
      b. For top surface of bearing walls,
         1). in 10 feet 1/8 inch”
         2). within width of a single unit 1/16 inch.
   3. Variation of the linear building lines from established position in plan related portion of columns and partitions:
      a. In any bay or 20 feet maximum 1/4"
   4. Variation in cross-sectional dimensions of columns and in thickness of walls:
      a. Minus 1/8"
      b. Plus 1/8"
   5. Variation in dimensions of masonry openings:
      a. Horizontal dimension -0" + 1/16"
      b. Vertical dimension +0"- 1/16"
   6. Variation in Mortal-Joint Thickness: Do not vary from bed-joint thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary bed-joint thickness from bed-joint thickness of adjacent course by more than 1/8 inch. Do not vary from head-joint thickness indicated by more than plus or minus 1/8 inch. Do not vary head-joint thickness from adjacent head-joint thickness by more than 1/8 inch. Do not vary from collar-joint thickness indicated by more than minus 1/4 inch or plus 3/8 inch.

F. Work of this Section shall conform to the requirements of the following:
   1. 2005 ACI 530/ASCE 5/TMS 402 Building Code Requirements for Masonry Structures.
   2. 2005 ACI 530-1/ASCE 6/TMS 602 Specifications for Masonry Structures.

G. Pre-Construction Conference: Prior to installation of masonry and associated work, Contractor shall arrange a meeting with Masonry Subcontractor, installers of related work, and other entities concerned with masonry wall performance, including the Architect and Owner. Contractor shall record discussions and agreements and furnish copy to each participant. Provide at least seventy-two (72) hours' advance notice to participants prior to convening conference. Review methods and procedures related to masonry work, including, but not limited to, the following:
   1. Review masonry requirements (drawings, specifications, and other Contract Documents).
   2. Review required submittals, both completed and yet to be completed.
   3. Review and finalize construction schedule related to masonry work and verify availability of materials, installer’s personnel, equipment and facilities needed to make

progress and avoid delays.

4. Review required inspection, testing, certifying and material usage accounting procedures.
5. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions.

H. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1093 to conduct the testing indicated.

I. Sole Source Responsibility
   1. Sole Source Responsibility: Obtain exposed Unit masonry from one source of a single manufacturer. Obtain accessory products used in conjunction with masonry from the unit masonry manufacturer or from sources acceptable to the manufacturer. The manufacturer shall furnish evidence that the specified materials have been manufactured by the same source and successfully utilized on a yearly basis for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.

J. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from authorities having jurisdiction.
   1. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.
   2. Requirements for fire–rated or lateral support conditions are not necessarily fully defined on the Drawings or specified; comply with applicable regulations.
   3. Inspections of the unit masonry work shall comply with IBC/New York City "Special Inspections" statutory requirements for "Unit Masonry" and for the requirements of the component materials, their fabrication and installation.

K. Unit masonry shall have up to 30% post-industrial recycled content.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and over causes. If units become wet, do not install until they are in an air- dried condition. Pack, deliver and store to prevent breakage, cracking, chipping, spalling or other damage. Store, protect and ventilate units at project site.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided. Store with provisions for good drainage.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil. Store and protect so that when placed, joint reinforcement and anchors will be free of soil, dirt, ice, loose rust, scale, or other coatings which would destroy or reduce bond with mortar, and will not be disfigured or bent out of shape.

E. Store packaged materials in manufacturer's unopened containers, marked with manufacturer's name and product brand name. Immediately reseal containers after partial use. Remove and replace damaged materials.

1.9 CODE REQUIREMENTS

A. Work of this Section shall conform to all applicable requirements of the New York City Building Code.
   1. Concrete block shall comply with Reference Standard RS-10.
   2. Concrete blocks shall be type approved by the Board of Standards and Appeals.
      a. Concrete blocks used for fireproofing shall conform to New York City Building Code requirements and shall provide ratings required by the Contract Documents.

B. Fire rated masonry partitions shall have MEA number.

C. Conform to New York City Local Law 17-95 for Seismic Requirements.

D. Comply with New York City Section 32-05 of Chapter 32 of Title 1 of the Official Compilation of the Rules of the City of New York regarding “Impact Resistant Stair and Elevator Enclosures” when such enclosures are of masonry construction.

1.10 PROJECT CONDITIONS

A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day’s work. Cover partially completed masonry when construction is not in progress.

B. In cold weather, when the outside temperature is below forty (40) degrees F., conform to the requirements of "Cold Weather Masonry Construction and Protection Recommendations" publication by Brick Industry Association (BIA). No anti-freeze admixtures are permitted.

C. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg. F. and above.

D. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
   1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.
   2. Protect sills, ledges, and projections from mortar droppings.
   3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
   4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
   1. Joint Reinforcement, Ties, and Anchors:
      a. Dur-O-Wal, Inc.
      b. Masonry Reinforcing Corp. of America.
      c. National Wire Products Industries.
      d. Or an Approved Equal.
   2. Glazed Concrete Masonry Units:
      a. Dur-O-Wal, Inc.
      b. Masonry Reinforcing Corp. of America.
      c. National Wire Products Industries.
      d. Or an Approved Equal.

2.2 CONCRETE MASONRY UNITS

A. General: Provide shapes indicated and as follows for each form of concrete masonry unit as required.
   1. Provide special shapes for lintels, comers, jambs, sash, control joints, headers, bonding, and other special conditions.
   2. Provide square-edged units for outside comers, except where indicated as bullnose.

2.3 MATERIALS

A. Standard Concrete Block
   1. Portland cement, ASTM C 150, Type 1, one source.
   2. Aggregates, ASTM C 33, normal weight
      a. All blocks shall be from one aggregate type and from one manufacturer.
   3. Concrete Masonry Units: Load bearing normal weight aggregate concrete masonry units conforming to the requirements of ASTM C 90.
      a. Unit Compressive Strength: Provide units with minimum average net-area compressive strength indicated below:
         1) 1900 psi.
         2) Not less than the unit compressive· strengths required to produce concrete unit masonry construction of compressive strength indicated.
      b. Weight Classification: Normal weight unless lightweight units are required to match existing adjoining units.
      c. Aggregates: Do not use aggregates made from pumice, scoria, or tuff.
      d. Provide Type I, moisture-controlled units.
      e. Size: Manufactured to the actual dimensions listed below (within tolerances specified in the applicable referenced ASTM specification) for the corresponding nominal sizes indicated on Drawings:
         1). 4 inch nominal: 3-5/8 inch actual.
         2). 6 inch nominal: 5-5/8 inch actual.
         3). 8 inch nominal: 7-5/8 inch actual.
         4). 10 inch nominal: 9-5/8 inch actual.
         5). 12 inch nominal: 11-5/8 inch actual.
         6). 16 inch nominal: 15-5/8 inch actual.
      f. Block for rated walls shall be 75% solid units.

g. All other block may be hollow units.

Pre-faced Concrete Masonry Units: Lightweight or normal weight concrete units indicated below with manufacturer's standard smooth resinous tile facing, complying with ASTM C 744:

h. For concrete masonry units to which prefaced surfaces are applied, comply with the following:
   1). Concrete Masonry Units: ASTM C 90, Type I, hollow and solid, moisture controlled units.
   2). Unit Compressive Strength: Provide units with minimum average net-area compressive strength indicated below:
      (a). 1900 psi, unless otherwise indicated.

i. Size: Manufactured to dimensions matching the existing adjoining units.

j. Color and Pattern: Match existing adjoining units as approved by the Resident Engineer.

k. Provide finished exposed ends and other exposed faces with special shapes and curves where required to match existing units or new units.

4. The producer of the concrete masonry units shall furnish certification from an independent testing laboratory confirming that all 8" or larger masonry units meet all of the UL 618 requirements for two (2) hours or better (as required), referencing full scale fire test reports (ASTM E 119). All 4" and 6" units shall conform to "National Bureau of Standards" and "National Research Council" full scale fire tests.
5. Sizes and Shapes: Nominal face size 8" x 16" by thickness as indicated on drawings, with stretcher units, jamb units, header units, square corner units (at ends and corners of exposed or painted work), sash units (at control joints within masonry wall), lintel units and other special shapes and sizes required to complete the work.
6. Finish: For exposed or painted block surfaces, in addition to ASTM requirements, block shall have uniformly dense, flat, fine grain texture, with no cracks, chips, spalls, or other defects which would impair appearance. For concealed CMU, surfaces shall be free from deleterious materials that would stain plaster or corrode metal.
7. Curing: All concrete block shall be steam cured, and air dried for not less than thirty (30) days before delivery.
8. Density of concrete block shall not exceed one hundred and twenty-five (125) lbs. per cubic foot.
9. Shrinkage: Shrinkage of concrete blocks shall not exceed 0.065% when tested in accordance with ASTM C 426-99.
10. Water Content
    a. At the time of delivery to the job site, concrete masonry units shall have a value, in weight of contained water, of not more than thirty (30) percent of the fully saturated content for the unit tested.
    b. Ship all units from the factory, and store at the job site, with all necessary protection to prevent increase of water content from rain and other sources.

B. Joint Reinforcing for Masonry Walls

1. General: Provide joint reinforcement formed from the following:
   a. For interior block walls and partitions, provide standard reinforcing fabricated of 9 ga. side and cross rods, truss or ladder design, no ties, spaced every other block course. Provide prefabricated pieces at corners and intersections of walls or partitions. Reinforcing shall be mill galvanized conforming to ASTM A 641, Class B-1, applied after fabrication.
   b. Wire used in assemblies noted above shall be cold drawn steel wire conforming to

ASTM A 82.

2. Approved Joint Reinforcing Manufacturers
   a. Hohmann & Barnard
   b. Dur-O-Wal
   c. Heckmann Building Products
   d. National Wire Products Industries, Inc
   e. Or an Approved Equal.
3. Anchors and Ties
   a. For anchoring masonry to structural steel, provide hot-dip galvanized steel, as listed, Or an Approved Equal:
      1). Made by Heckmann Building Products. Galvanizing shall conform to ASTM A 153, with zinc coating of 1.5 oz. of zinc per sq. ft.
         A. No. 195 Column Anchors
         B. No. 197 Column Anchors
         C. No. 315 Weld-On Anchor Rods with No. 316 Triangle Ties
         D. No. 315-B Weld-On Anchor Straps with No. 316 Triangle Ties

         Made by Hohmann & Barnard or approved equal. Galvanizing shall conform to ASTM A 153, with zinc coating of 1.5 oz. of zinc per sq. ft.
         A. No. 355 Column Anchors
         B. No. 356 Column Anchors
         C. No. 357 Beam Anchors
         D. No. 359 F anchor straps with VWT tie.
      2). For anchoring CMU interior partitions to underside of steel beams, provide hot dip

         galvanized steel tube anchors equal to No. 419 and No. 421 made by Heckmann Building Products, No. PTA-420 made by Hohmann & Barnard, Or an Approved Equal
      3). For anchoring CMU interior partitions to underside of structural deck, provide 4" x 4" x 1/4" galvanized steel angles (ASTM A 36), 3'-0" long spaced 3'-0" o.c. alternately on each side of partition. Anchor partition securely to structural deck.
4. Reinforcing Bars and Rods: ASTM A 615, Grade 60. See Drawings for size.
5. Description: Welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet, with prefabricated corner and tee units, and complying with requirements indicated below:
   a. Wire Diameter for Side Rods: 0.1483 inch.
   b. Wire Diameter for Cross Rods: 0.1483 inch.
6. For single-wythe masonry, provide type as follows with single pair of side rods:
   a. Ladder design with perpendicular cross rods spaced not more than 16 inches o.c.

C. TEES AND ANCHORS, GENERAL
1. General: Provide ties and anchors specified in subsequent articles that comply with requirements for metal and sizes provided in this this Article, unless otherwise indicated.
2. Wire: As follows:
   a. Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
   b. Wire Diameter: 0.1875 inch.
3. Steel Sheet: As follows:
   a. Galvanized Steel Sheet: ASTM A 526, G 60 (commercial quality), steel sheet zinc coated by hot-dip process on continuous lines prior to fabrication, for sheet-metal ties and anchors in interior walls.
4. Steel Plates and Bars: ASTM A 36, shop painted with 2 coats of coal-tar epoxy- polyamide

paint complying with SSPC-Paint 16 to comply with SSPC-PA 1 for painting arid SSPC-SP 6 for surface preparation.

D. ADJUSTABLE ANCHORS FOR CONNECTING TO STRUCTURAL FRAME

1. General: Provide 2-piece assemblies as described below, allowing vertical or horizontal differential movement between wall and frame parallel to plane of wall but resisting tension and compression forces perpendicular to it.
   a. For anchorage to concrete, provide manufacturers standard anchors with dovetail anchor section formed from sheet metal and triangular-shaped wire tie section sized to extend within 1 inch of masonry face and as follows:
      - Wire Diameter: 0.1875 inch.
   b. For anchorage to steel framing, provide manufacturer's standard anchors with crimped 1/4-inch-diameter wire anchor section for welding to steel and triangular- shaped wire tie section sized to extend within 1 inch of masonry face and as follows:
      - Wire Diameter: 0.1875 inch.

E. CONTROL AND EXPANSION JOINT FILLERS

1. Vertical Installation Within Concrete Masonry Wall: Extruded high grade neoprene rubber, cross shape, for use with concrete masonry sash units, which shall provide a force fit in the grooves of the sash block and shall have 1/2" diameter tubular ends (compressed 25% when installed in 3/8" wide joint).
   a. Provide the following sizes:
      1.) 2-5/8" wide control joint fillers for 4" block wall.
      2.) 4-5/8" wide for 6" block walls.
      3.) 6-5/8" wide for 8", 10" and 12" block walls.
   b. Provide backer rod and sealant joint over joint filler as per drawings and Section 079200 of these specifications.
2. Isolation Joint Filler at Abutting Construction and at Intersecting CMU Walls: Compressible and resilient closed cell neoprene gasket with pressure sensitive adhesive backing, thickness 30% greater than thickness of joint. Acceptable joint filler shall be "Everlastic, Type NN-1" by Williams Products, Inc., Or an Approved Equal. Recess joint filler and install backer rod and sealant as per drawings and Section 079200 of these specifications.

2.4 RIGID ANCHORS

A. General: Fabricate from steel bars as follows:
   1. 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins.

2.5 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Pre-molded filler strips complying with ASTM D 1056, Type 2, Class A, Grade 1; compressible up to 35 percent; of width and thickness indicated; formulated from the following material:
   1. Neoprene.
   2. Urethane.
   3. Polyvinyl chloride.

B. Preformed Control-Joint Gaskets: Material as indicated below; designed to fit standard sash block and to maintain lateral Stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt)

2.6 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, standard color, one source.
B. Hydrated Lime: ASTM C 207, Type S,
C. Masonry Cement: ASTM C 91.
D. Portland Cement-Lime Mix: Packaged blend of Portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.
E. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch, use aggregate graded with 100 percent passing the No. 16 sieve.
F. Aggregate for Grout: ASTM C 404.
G. Ready-Mixed Mortar: Cementitious materials, water, and aggregate complying with requirements specified in this Article; combined with set-controlling admixtures to produce a ready-mixed mortar complying with ASTM C 1142.
H. Water: Potable

2.7 SOURCE QUALITY CONTROL

A. Subcontractor’s Quality Control Responsibilities: Subcontractor is solely responsible for quality control of the Work.

B. General: Provide and maintain an effective Quality Control program and perform sufficient inspections, surveys and tests of the Work, including those of other trades, to ensure compliance with the Contract Documents. Furnish appropriate facilities, accurately calibrated instruments and testing devices required to perform the quality control operations and with sufficient work forces to cover the construction operations within the actual construction sequences. Coordinate this work with the quality control requirements of other technical Sections of the Specifications and with requirements of the Owner and governing authorities having jurisdiction.

C. Subcontractor's Testing: Perform testing in an independent certified testing laboratory. Furnish the laboratory enough specimens to comply with referenced testing standards. Test and furnish test reports for materials specified.

1. Concrete Masonry Unit Testing: After the Consultant's review of samples, test each type, class and grade of concrete masonry unit specified in accordance with ASTM C140. Provide testing specimens from actual production batches. Perform the following tests:
   a. Compressive strength
   b. Absorption.
   c. Moisture Content
   d. Weight
   e. Dimensions
2. Prism Test: Provide a prism test for each type of wall construction indicated. Prism test concrete unit masonry to determine the actual f'm of the concrete unit masonry wall construction. Construct and test concrete unit masonry prisms in accordance with ASTM C1314, and to comply with requirements of local authorities having jurisdiction. Test grouted and hollow concrete unit masonry wall specimens. Test concrete unit masonry

thickness and mortar types intended for use on the Project. Test prisms a minimum of 16 in. in height.

3. Aggregate Testing: Test aggregate as follows:
   a. Mortar Aggregate: ASTM C144
   b. Grout Aggregate: ASTM C404.
4. Mortar Testing: Test mortar samples in accordance with ASTM C780 for mortar compression strength, composition, and properties. Test each mortar mix type and color each week. Prior to commencement of Work, provide preconstruction tests to establish a basis for comparison.
5. Grout Testing: Test and submit test reports of grout samples in accordance with ASTM C1019 for compression strength. Test grout during construction for each 5000 ft2. of wall area or portion thereof. Prior to commencement of Work, provide preconstruction tests to establish a basis for comparison.
6. Chloride Ion Testing: Test each mortar and grout mix to verify that the total chloride (Cl) ion content of each mix is within the specified limits. Perform chloride tests in accordance with ASTM C1152.

2.8 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents; accelerators, retarders, water repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.
   2. No air-entraining admixtures or cementitious materials containing air-entraining
   3. admixtures shall be used in the mortar.
   4. No antifreeze compounds or other substances shall be used in the mortar to lower the freezing point.

B. Unit Masonry Construction: Provide Portland cement/lime mortar conforming to ASTM C 270, as indicated below: Type N.
   1. Limit cementitious materials in mortar to Portland cement and lime.
   2. For above-grade, non-load-bearing walls and parapet walls; for interior non-load-bearing partitions, and for other applications where another type is not indicated, use Type N.
   3. For load bearing conditions, mortar shall conform to ASTM C 270, Type M.

C. Mortar for Cement Cants: One (1) part Portland cement and four (4) parts sand, by volume.

D. Grout for Unit Masonry: Comply with ASTM C 476 for grout for use in construction of unit masonry. Use grout of consistency indicated or, if not otherwise indicated, of consistency (fine or coarse) at time of placement that will completely fill spaces intended to receive grout.
   1. Use fine grout in grout spaces less than 2 inches in horizontal dimension, unless otherwise indicated.
   2. Use coarse grout in grout spaces 2 inches or more in least horizontal dimension, unless otherwise indicated.

E. Mixing
   1. General: Add cement just before mixing and mix dry. Use sufficient amount of water as necessary to produce workable mix. Mix in small batches to make plastic mass.
   2. Mixing: Machine mix all mortars in approved type mixer with device to accurately and

uniformly control water. Add hydrated lime dry. Mix dry materials not less than two (2) minutes. Add water, then mix not less than three (3) minutes. Mix only amount of mortar that can be used before initial set. Do not use mortar which has reached its initial set or two (2) hours after initial mixing, whichever comes earlier. Mortar may not be re-tempered. Clean mixer for each batch, whenever mortar type is changed, and at end of each day's work.

3. Acceleration or other admixtures not permitted.
4. Mortar shall have a flow after suction of not less than seventy-five (75) percent of that immediately after mixing as determined by ASTM C 91.

2.9 FIRESTOPPING

A. Provide Firestopping for all new wall fire rated unit partitions.

PART 3- EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of unit masonry. Do not proceed with installation until unsatisfactory conditions have been corrected.
   1. Prior to all work of this Section, carefully inspect the installed work of all other trades, and verify that all such work is complete to the point where this installation may properly commence.
   2. Verify that masonry may be completed in accordance with all pertinent codes and regulations, the referenced standards, and the original design.
   3. Do not start any work until mock-ups are approved by the Architect.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of unit masonry.
   1. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

C. Examine existing glazed concrete masonry walls that require patching and/ or toothing. Record any conditions that need correction prior to commencement of work.

3.2 COORDINATION

A. Carefully coordinate with all other trades to ensure proper and adequate interface of the work of other trades with the work of this Section.

3.3 PREPARATION

A. Concrete Block: Do not wet concrete block units.

B. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer.

C. Surface Preparation: Clean surfaces scheduled for unit masonry, before installation to remove dirt, dust, debris, loose material, and other foreign matter detrimental to proper

bonding.

D. Lay Out of Walls: Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.

3.4 INSTALLATION, GENERAL

A. Build walls to the full thickness shown. Build single wythe walls to the actual thickness of the masonry units, using units of nominal thickness shown.

B. Build chases and recesses to accommodate items specified in this and other Sections of the Specifications. Build chases and recesses as shown or required for the work of other trades.

C. Leave openings for equipment to be installed before completion of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to the opening.

D. Cut masonry units with motor-driven saws to provide clean, sharp, un-chipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting, where possible. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Mix units for exposed unit masonry from several pallets or cubes as they are placed to produce uniform blend of colors and textures.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

G. Lay walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

H. Provide templates made of steel studs for plumbing of two story masonry openings.

I. Pattern Bond: Lay exposed masonry patterns as noted on drawings. If not shown, provide running bond. Lay concealed concrete block with all units in a wythe bonded by lapping not less than two (2) inches. Bond and interlock each course of each wythe at corners. Do not use units of less than four (4) inches horizontal face dimensions at corners or jambs.

J. Where possible, masonry walls and partitions shall be built after all overhead ducts, pipes and conduits are in place and tested. Masonry shall be neatly built around the items above. Walls and partitions shall be plumb, true to line and free from defects such as open cells, voids, dry joints and other similar defects. In rooms and spaces scheduled to have concrete block finish, all such surfaces including upper wall surfaces up to termination of structural ceiling in spaces without suspended ceilings, shall be made suitable for paint application. Cutting of openings in walls and partitions in place shall be done only with the approval of the Architect.

K. Lay masonry with all units in a wythe in running bond or bonded by lapping not less than 2

inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

L. Stopping and Resuming Work.: In each course, rack back 1/2-unit length for one-half running bond or 1/3-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar prior to laying fresh masonry.

M. Built-in Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.

N. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

O. Build no-load-bearing interior partitions full height of story to underside of solid floor or roof structure above and as follows:
1. Install compressible filler in joint between top of partition and underside of structure above.
2. Wedge no-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.

3.5 MORTAR BEDDING AND JOINTING

A. Lay concrete masonry units
1. With full mortar coverage on horizontal and vertical face shells.
2. Bed webs in mortar in starting course on exterior walls and in all courses of piers, columns and pilasters, where solid CMU is used and where adjacent to cells or cavities to be reinforced or filled with concrete or grout.
3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
4. Maintain joint widths indicated, except for minor variations required to maintain bond alignment. If not indicated, lay walls with 3/8-inch joints.

B. Lay solid brick-size masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumb-print hard, using a jointer larger than joint thickness, unless otherwise indicated.

D. Cut joints flush for masonry walls that arc to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

E. Concealed joints shall be struck flush.

F. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners at jambs to fit stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.

3.6 HORIZONTAL-JOINT REINFORCEMENT

A. General: Provide continuous horizontal-joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcing a minimum of 6 inches.
   1. Space reinforcement not more than 16 inches o.c.
   2. Provide reinforcement in mortar joint 1 block course above and below wail openings and extending 12 inches beyond opening.
      a. Reinforcement above is in addition to continuous reinforcement.

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at corners and wall intersections by using prefabricated “L” and “T” sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
   1. Provide an open space not less than 1/2" in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
   2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
   3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o. c. horizontally.

3.8 TIES AND ANCHORS FOR VENEER INSTALLATION

A. Provide ties and anchors as shown or specified, but not less than one metal tie, spaced not to exceed sixteen (16) inches o.c. horizontally and/ or vertically. Provide additional ties within 1'- 0" of all openings and spaced not more than 24" apart around perimeter of openings.

3.9 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as the masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.

B. Form control joints in concrete masonry as follows:
   1. Fit bond-breaker strips into hollow contour in ends of block units on one side of control joint. Fill the resultant core with grout and rake joints in exposed faces.
   2. Install preformed control-joint gaskets designed to fit standard sash block.
   3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake joint.
   4. Install temporary foam plastic filler in head joints and remove when unit masonry is complete.

C. CMU Control Joint Spacing: If location of control joints is not shown, place vertical joints spaced not to exceed 20'-0" o.c. In addition, locate joints at points of natural weakness in the masonry work, including the following:
   a. At structural column or joint between bay.
   b. Above control joints in the supporting structure.
   c. Above major openings at end of lintels upward and below at ends of sills downward. Place at one side of jamb for openings not less than 7'-0" wide and at both sides for openings over 6'-0" wide.
   d. At reduction of wall thickness.
   e. Where masonry abuts supporting structure.
   f. If additional joints are required, indicate same on approved shop drawings.

3.10 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry lintels where required and where openings of more than 12 inches for brick size units and 24 inches for block size units are shown without structural steel or other supporting lintels.
   1. Provide precast lintels made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcement bars indicated or required to support loads indicated. Cure precast lintels by same method as CMU.
   2. Provide prefabricated or built-in-place masonry lintels. Use specially formed bond beam units with reinforcement bars placed as indicated and filled with coarse grout in accordance with the following table. Cure precast lintel before handling and installing. Temporarily support built-in-place lintel until cured.

Number and Size of Reinforcing Bars Required at Concrete Block Lintels (Unless Otherwise Noted)		
Maximum Clearance Span	Wall Width	Rebar No.- Size
2'-0" to 6'-0" 6'-0" to 8'-0"	6"	2- #3 2- #4
2'-0" to 6'-0" 6'-0" to 8'-0"	8"	2- #3 2- #4
2'-0" to 6'-0" 6'-0" to 8'-0"	12"	3- #3 3- #4

   3. Provide either of above at Contractor's option or provide precast or formed-in- place concrete lintels complying with requirements of Division 3 Section "Cast- in-Place Concrete."

C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

D. Installation of Loose Lintels, Relieving Angles and Other Miscellaneous Support Steel: Install loose lintels, relieving angles and other miscellaneous support steel where shown.

Adjust as required to provide square, level, plumb and true openings for attachment and alignment of other work. Grout lintels fully.

1. Fill cores in hollow concrete unit masonry with grout 3 courses 24 in. under bearing plates, beams, lintels, posts, and similar items, unless otherwise shown.
2. At underside of relieving angles and other miscellaneous support steel where shown or required, provide compressible filler.

3.11 INSTALLATION OF REINFORCED UNIT MASONRY

A. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.
   1. Construct formwork to conform to shape, line, and dimensions shown. Make sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
   2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

B. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
   1. Do not exceed the following pour heights for fine grout:
      a. For minimum widths of grout spaces of 3/4 inch or for minimum grout space of hollow unit cells of 1-1/2 by 2 inches, pour height of 12 inches.
      b. For minimum widths of grout spaces of 2 inches or for minimum grout space of hollow unit cells of 2 by 3 inches, pour height of 60 inches.
      c. For minimum widths of grout spaces of 2-1/2 inches or for minimum grout space of hollow unit cells of 2-1/2 by 3 inches, pour height of 12 feet.
      d. For minimum widths of grout spaces of 3 inches or for minimum grout space of hollow unit cells of 3 by 3 inches, pour height of 24 feet.
   2. Do not exceed the following pour heights for coarse grout:
      a. For minimum widths of grout spaces of 1-1/2 inches or for minimum grout space of hollow unit cells of 1-1/2 by 3 inches, pour height of 12 inches.
      b. For minimum widths of grout spaces of 2 inches or for minimum grout space of hollow unit cells of 2-1/2 by 3 inches, pour height of 60 inches.
      c. For minimum widths of grout spaces of 2-1/2 inches or for minimum grout space of hollow unit cells on by 3 inches, pour height of 12 feet.
      d. For minimum widths of grout spaces of 3 inches or for minimum grout space of hollow unit cells of 3 by 4 inches, pour height of 24 feet.
   3. Provide clean-out holes at least 3 inches in least dimension for grout pours over 60 inches in height.
      a. Provide clean-out holes at each vertical reinforcing bar.
      b. At solid grouted masonry, provide clean-out holes at not more than 32 inches o. c.

3.12 BUILT-IN WORK

A. As the work progresses, build in items specified under this and other Sections of these specifications. Fill in solidly with masonry around built-in items.

B. Mortar in door frames, access doors, louvers and other metal items embedded or built into masonry work solidly with mortar as the masonry units are laid up.

C. Grout under lintels, bearing plates, and steel bearing on masonry with solid bed grout.

D. Sleeves, pipes, ducts and all other items which pass through masonry walls shall be caulked with interior grade sealant meeting requirements of Section 079200, so as to be airtight and prevent air leakage. Refer to Section 078413 for packing of voids in rated masonry walls.

E. Fill vertical cells of masonry units solid with grout which have anchoring, reinforcing rods, supporting, or hanging devices embedded in the cell including stone anchors and window or curtain wall anchors.

F. Fill vertical cells of masonry units solid with mortar on each side of door frames to sixteen (16) inches beyond.

G. Unless otherwise noted, fill vertical cells of masonry units solid with grout which are below steel bearing plates, steel beams, and ends of lintels, to eight (8) inches beyond bearing and from floor to bearing.

H. Place wire mesh in horizontal joint below masonry unit cells to be filled with mortar, to prevent mortar from dropping into unfilled cells below.

I. Masonry indicated as being reinforced shall have all voids filled solid with grout. Grout shall be consolidated in place by vibration or other methods which insure complete filling of cells. When the least clear dimension of the grouted cell is less than two (2) inches, the maximum height of grout pour shall not exceed twelve (12) inches. When the least clear dimension is two
(2) inches or more, maximum height of grout pour shall not exceed forty-eight (48) inches. When grouting is stopped for one (1) hour or longer, the grout pour shall be stopped 1-1/2" below the top of a masonry unit. Vertical bar reinforcing shall be accurately placed and held in position while being grouted and shall be in place before grouting starts. All such reinforcing shall have a minimum clear cover of 5/8". Lap all bars a minimum of forty (40) bar diameters and provide steel spacer ties (not to exceed 192 bar diameter) to secure and position all vertical steel and prevent displacement during grouting. Provide continuous horizontal reinforcement embedded in mortar joints every second course.

3.13 CUTTING AND PATCHING

A. All exposed masonry which requires cutting or fitting shall be cut accurately to size with motorized carborundum or diamond saw, producing cut edges.

B. Do not saw cut any masonry openings in face brick construction without Architect's approval and after a procedure has been reviewed and approved.

C. Holes made in exposed masonry units for attachment of handrail brackets and similar items shall be neatly drilled to proper size.

D. All masonry which requires patching in exposed work, if approved by Architect, shall be patched neatly with mortar to match appearance of masonry as closely as possible and to the Architect's satisfaction. Rake back joints and use pointing mortar to match as required.

3.14 SOLID WALL CONSTRUCTION

A. Fill the vertical longitudinal joint between wythes solidly with mortar by parging the in-place wythe and shoving units into the parging.

B. Tie wythes with continuous horizontal reinforcement embedded in mortar joints sixteen (16) inches o.c. vertically.

3.15 INTERIOR BLOCK PARTITIONS

A. Build to full height unless otherwise shown on drawings. At non-rated partitions fill void between CMU and structural deck with continuous neoprene filler conforming to the requirements of Section 079200. At fire rated partitions, fill void with fire stop material meeting the requirements of Section 078413. Fasten to structure at top of partition using steel angles as specified herein.

B. Provide continuous horizontal joint reinforcing every other block course, except as otherwise noted. Fully embed longitudinal side rods in mortar for their entire length with a minimum cover of 5/8". Lap reinforcement a minimum of six (6) inches at ends of units.

C. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.

D. Corners
1. Provide interlocking masonry unit bond in each course at corners.
2. Provide continuity at corners with prefabricated "L" reinforcement units, in addition to masonry bonding.

E. Intersecting and Abutting Walls
   a. Unless vertical control joints are shown as part of structural frame, provide interlocking masonry bond. Provide starters and special shapes as shown on the drawings to bond these walls.
   b. In addition to masonry bonding, provide horizontal reinforcement using prefabricated "T" units at interior partitions.

3.16 CANTS

A. Provide specified mortar for cement cants at beams and other projections in elevator shafts, where adjoining wall is of masonry construction. Cants shall slope seventy (70) degrees from the horizontal.

3.17 PROTECTION, ADJUSTMENT, REPAIRING, POINTING, AND CLEANING

A. Protection
1. The Contractor shall take adequate precautions for the protection of all surfaces against mortar spatter and shall immediately remove any such spatter should it inadvertently occur, leaving no stain or discoloration.
2. Excess mortar shall be wiped off the masonry surfaces as the work progresses.
3. Wood coverings shall be placed over all such masonry surfaces as are likely to be damaged

during the progress of the entire project.

4. Protective measures shall be performed in a manner satisfactory to the Architect.
5. Damaged masonry units shall be replaced to satisfaction of the Architect.
6. Exterior masonry walls shall be draped with waterproof covering until copings are in place, to prevent water penetration in cavity.

B. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units; install in fresh mortar or grout, pointed to eliminate evidence of replacement.

C. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point-up joints, including comers, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for application of sealants. Point any defective joint with mortar identical with that specified for that joint.

D. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears prior to tooling joints.

E. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
3. Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear Water.
4. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain present on exposed surfaces.
5. Upon completion, all exposed masonry shall be thoroughly cleaned following recommendations of the IMI Technical Note No. 20. Before applying any cleaning agent to the entire wall, it shall be applied to a sample wall area of approximately 4' x 4' in a location approved by the Architect. No further cleaning work may proceed until the sample area has been approved by the Architect, after which time the same cleaning materials and method shall be used on the remaining wall area. If stiff brushes and water do not suffice, the surface shall be thoroughly saturated with clear water and then scrubbed with a solution of an approved detergent masonry cleaner, equal to "Vana Trol" made by ProSoCo Inc. or equal made by Diedrich or approved equal, mixed as per manufacturer's directions, followed immediately by a thorough rinsing with clear water. All lintels and other corrodible parts shall be thoroughly protected during cleaning.

F. Protection: Provide final protection and maintain conditions that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

3.18 MASONRY WASTE DISPOSAL

A. Undamaged, excess masonry materials are Contractor’s property and shall be removed from the Project site for his use.

3.19 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

B. All unit masonry installation costs (whether full or partial partitions, or repairs) shall include all required reinforcing, anchorage, attachments, grouts, fire stopping, and all other items required to complete the referenced installation.

END OF SECTION 042000

SECTION 042113
BRICK MASONRY

PART 1 – GENERAL

1.1 SUMMARY

A. Work Included: Provide brick masonry work in accordance with the Contract Documents. This Section includes the following:
   1. Brick unit masonry.
   2. Brick paving.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 4 “Maintenance of Masonry” – 040100
   2. Division 4 “Maintenance of Stone Assemblies” – 040140
   3. Division 4 “Unit Masonry” – 042000
   4. Division 4 “Stone Masonry” – 044300
   5. Division 4 “Masonry Cleaning” – 045200
   6. Division 7 “Penetration Firestopping” – 078413

1.2 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops the following installed compressive strengths (fm) at 28 days.
   1. For Brick Unit Masonry: As follows, based on gross area:
      a. fm = 1500 psi (10.3 MPa).

1.3 SUBMITTALS

A. Product data for each different masonry unit, accessory, and other manufactured product specified.

B. Samples for verification of the following:
   1. Full-size units for each different exposed masonry unit required showing the full range of exposed colors, textures, and dimension to be expected in the completed construction.
      a. Include size-variation data for brick, verifying that actual range of sizes for brick falls within ASTM C 216-dimension tolerances.
   2. Accessories embedded in the masonry.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted fur these characteristics, from one source and by a single manufacturer for each different product required.

B. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and

from one source or producer for each aggregate.

C. Mockup: Prior to installing unit masonry, construct 2 feet by 2 feet sample wall panels to verify selections made under sample submittals and to demonstrate aesthetic effects of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.
   1. Notify DCAS one week in advance of the dates and times when mockups will be constructed.
   2. Protect accepted mockups from the elements with weather-resistant membrane.
   3. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
      a. Acceptance of mockups is for color, texture and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by DCAS in writing.
      b. Acceptance of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by DCAS in writing.
      c. When directed, demolish, and remove mockups from Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not install until they are in an air- dried condition.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Platform materials shall not cause damage to brick masonry by absorbing moisture, dust or staining. Only undamaged and uncontaminated brick masonry units matching the Architect's sample and accepted by DCAS shall be installed in the Work.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 PROJECT CONDITIONS

A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches (600mm) down both sides and hold cover securely in place.

B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
   1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit masonry damaged by frost or freezing conditions. Comply with the following requirements:
   1. Cold Weather Construction: When the ambient temperature is within the limits indicated, use the following procedures:
      a. 40 to 32 deg F (4 to 0 deg C): Heat mixing water or sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C)
      b. 32 to 25 deg F (0 to -4 deg C): Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry.
      c. 25 to 20 deg F (-4 to -7 deg C): Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F (4 deg C) if grouting. Use heat on both sides of walls under construction.
      d. 20 deg F (-7 deg C) and Below: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F (4 deg C). Provide enclosures and use heat on both sides of walls under construction to maintain temperatures above 32 deg F (0 deg C) within the enclosures.
   2. Cold-Weather Protection: When the mean daily temperature is within the limits indicated, provide the following protection:
      a. 40 to 25 deg F (4 to -4 deg C): Cover masonry with a weather-resistant membrane for 48 hours after construction.
      b. 25 to 20 deg F (-4 to -7 deg C): Cover masonry with insulating blankets or provide enclosure and heat for 48 hours after construction to prevent freezing. Install wind breaks when wind velocity exceeds 15 mi./h (25 km/h).
      c. 20 deg F (-7 deg C) and Below: Provide enclosure and heat to maintain temperatures above 32 deg F (0 deg C) within the enclosure for 48 hours after construction.
   3. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried out, but not less than 7 days after completion of cleaning.

D. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F (38 deg C) and above.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
   1. Brick:

a. Glen-Gery Corporation.
b. Belden Brick Company.
c. Or an Approved Equal.

2. Portland Cement, Mortar Cement, Masonry Cement, and Lime:
a. Essroc Materials, Inc.
b. Glen-Gery Corporation.
c. Lafarge Corporation.
d. Lehigh Portland Cement Co.
e. Riverton Corporation (The).
f. Or an Approved Equal.

3. Mortar Pigments:
a. Davis Colors.
b. Lafarge Corporation.
c. Solomon Grind-Chern Services, Inc.
d. Or an Approved Equal.

4. Joint Reinforcement, Ties, and Anchors:
a. Dur-O-Wal, Inc.
b. Masonry Reinforcing Corp. of America,
c. National Wire Products Industries.
d. Or an Approved Equal.

1.7 BRICK

A. General: Provide shapes indicated and as follows for each form of brick required.
1. Provide units without cores or frogs and with exposed surfaces finished for ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces.

B. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
1. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

C. Face Brick: ASTM C 216 and as follows:
1. Grade and Unit Compressive Strength: Provide units with grade and minimum average net-area compressive strength indicated below:
a. Grade: SW.
b. Not less than the unit compressive strengths required to produce clay masonry construction of compressive strength indicated.
2. Initial Rate of Absorption: Between 5 and 20 g/30 sq. in. (g/194 sq. cm) per minute when tested per ASTM C 67.
3. Surface Coloring: Brick with surface coloring other than flashed or sand-finished brick, shall withstand 50 cycles of freezing and thawing per ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet (3 m).
4. Type: FBX.
5. Size: Bricks manufactured to the following actual dimensions within tolerances specified

in ASTM C 216:

a. Standard: 3-1/2 to 3-5/8 inches (89 to 92 mm) thick by 2-1/4 inches (57 mm) high by 8 inches (203 mm) long.

6. Application: Use where brick is exposed, unless otherwise indicated.
7. Color and Texture: Match DCAS's samples.
8. Brick Pavers: Equal to Belden Brick No. 133 or an Approved Equal, Flashed Pavers.

1.8 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150. Type I or II, except Type III may be used for cold- weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Masonry Cement: ASTM C 91.
1. For pigmented mortars use premixed colored masonry cements of formulation required to produce color indicated, or if not indicated, as selected from manufacturer's standard formulations. Pigments shall not exceed 5 percent of masonry cement by weight for mineral oxides nor 1 percent for carbon black.
2. For colored-aggregate mortars, use masonry cement of natural color or white as required to produce mortar color indicated.

C. Hydrated Lime: ASTM C 207, Type S.

D. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III and hydrated lime complying with ASTM C 207.
1. For pigmented mortars, use colored portland cement-lime mix of formulation required to produce color indicated, or if not indicated, as selected from manufacturer's standard formulations. Pigments shall not exceed 10 percent of portland cement by weight for mineral oxides nor 2 percent for carbon black.

E. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4-inch (6.5 mm), use aggregate graded with 100 percent passing the No. 16 (1.18 mm) sieve.
1. White-Mortar Aggregates: Natural white sand or ground white stone.
2. Colored-Mortar Aggregates: Natural-colored sand or ground marble, granite, or other sound stone, as required to match DCAS's sample.

F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.

G. Cold-Weather Admixture: Non-chloride, non-corrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by the manufacturer for use in masonry mortar of composition indicated.

H. Water: Potable.

I. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following (approved equals will also be accepted):
1. Colored Masonry Cement:
a. Brixment-in-Color; Essroc Materials, Inc.
b. Centurion Colorbond; Lafarge Corporation.
c. Lehigh Custom Color Masonry Cement; Lehigh Portland Cement Co.

d. Flamingo Color Masonry Cement; Riverton Corporation (The).
e. Or an Approved Equal.

2. Colored Portland Cement-Lime Mix:
   a. Color Mortar Blend; Glen-Gery Corporation.
   b. Centurion Colorbond PL; Lafarge Corporation.
   c. Lehigh Custom Color Portland/Lime; Lehigh Portland Cement Co.
   d. Riverton Portland Cement Lime Custom Color; Riverton Corporation (The).
   e. Or an Approved Equal.
3. Mortar Pigments:
   a. True Tone Mortar Colors; Davis Colors.
   b. Centurion Pigments; Lafarge Corporation.
   c. SGS Mortar Colors; Solomon Grind-Chern Services, Inc.
   d. Or an Approved Equal.
4. Cold-Weather Admixture:
   a. Accelguard 80; Euclid Chemical Co.
   b. Morset; Grace: W.R. Grace & Co.
   c. Or an Approved Equal.
5. Water-Repellent Admixture:
   a. Dry-Block Mortar Admixture; Grace: W.R. Grace & Co.
   b. Or an Approved Equal.

J. Latex additive (water emulsion) described below, serving as replacement for pan or all of gaging water, of type specifically recommended by latex additive manufacturer for use with job-mixed portland cement and aggregate and not containing a retarder.
   1. Latex Additive: Acrylic resin.

1.9 TIES AND ANCHORS, GENERAL

A. General: Provide corrugated ties and anchors specified in subsequent articles that comply with requirements for metal and size of this Article, unless otherwise indicated.
   1. Stainless-Steel Sheet: ASTM A 167, Type 304 or 316.
   2. 0.0625 inch (1.6 mm) minimum thickness.

1.10 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Pre-molded filler strips complying with ASTM D 1056, Type 2, Class A, Grade 1; compressible up to 35 percent; of width and thickness as required; formulated from the following material:
   1. Neoprene.
   2. Urethane.
   3. Polyvinyl chloride.

1.11 MASONRY CLEANERS

A. Job-Mixed Detergent Solution: Solution of 1/2-cup (0.14-L) dry measure tetrasodium polyphosphate and 1/2-cup (0.14-L) dry measure laundry detergent dissolved in 1 gal. (4 L) of water.

B. Proprietary Acidic Cleaner: Manufacturer's standard-strength, general-purpose cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry surfaces of type indicated below without discoloring or damaging masonry surfaces; expressly approved for intended use by manufacturer of masonry units being cleaned.
   1. For masonry not subject to metallic oxidation stains, use formulation consisting of a concentrated blend of surface-acting acids, chelating, and wetting agents.
   2. For dark-colored masonry not subject to metallic oxidation stains, use formulation consisting of a liquid blend of surface-acting acids and special inhibitors.
   3. For masonry subject to metallic oxidation stains, use formulation consisting of a liquid blend of organic and inorganic acids and special inhibitors.
   4. Available Products: Subject to compliance with requirements, products that may be used to clean unit masonry surfaces include, but are not limited to, the following:
      a. 202 New Masonry Detergent; Diedrich Technologies, Inc.
      b. 200 Lime Solv; Diedrich Technologies, Inc.
      c. 202V Vana-Stop; Diedrich Technologies, Inc.
      d. Sure Klean No. 600 Detergent; ProSoCo, Inc.
      e. Sure Klean No: 101 Lime Solvent; ProSoCo., Inc.
      f. Sure Klean Vana Trol; ProSoCo, Inc.
      g. Or an Approved Equal.

1.12 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.
   2. Add cold-weather admixture (if used) at the same rate for all mortar, regardless of weather conditions, to ensure that mortar color is consistent.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification, for types of mortar indicated below:
   1. Limit cementitious materials in mortar to portland cement and lime. Type: S.

C. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required.
   1. Limit pigments to the following percentages of cement content by weight:
      a. For mineral oxide pigments and portland cement-lime mortar, not more than 10 percent.
      b. For carbon-black pigment and portland cement-lime mortar, not more than 2 percent.
      c. For mineral oxide pigments and masonry cement mortar, not more than 5 percent.
      d. For carbon-black pigment and masonry cement mortar, not more than 1 percent.

D. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates combined with selected cementitious materials.

E. Mix to match existing adjoining mortar.

F. Latex-Modified Portland Cement Setting-Bed Mortar: Proportion and mix Portland cement, aggregate, and latex additive for setting bed to comply with directions of latex additive

manufacturer and as necessary to produce stiff mixture with a moist surface when bed is ready to receive pavers.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of unit masonry. Do not proceed with installation until unsatisfactory conditions have been corrected.
   1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of unit masonry.

B. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.

3.2 INSTALLATION, GENERAL

A. Thickness: Build walls and other masonry construction to the full thickness shown.

B. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full- size units without cutting, where possible. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

C. Mix units for exposed unit masonry from several pallets or cubes as they are placed to produce uniform blend of colors and textures.

D. Wetting of Brick: Wet brick prior to laying if the initial rate of absorption exceeds 30 g/30 sq. in (g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb the water so they are damp but not wet at the time of laying.

3.3 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of columns, walls, and arrises, do not exceed 1/4 inch in 10 feet (6 mm in 3 m), nor 3/8 inch in 20 feet (10 mm in 6 m), nor 1/2 inch in 40 feet (12 mm in 12 m) or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 2 m), nor 1/2 inch in 40 feet (12 mm in 12 m) or more. For vertical alignment of head joints, do not exceed plus or minus 1/4 inch in 10 feet (6 mm in 3 m), nor 1/2-inch (12 mm) maximum.

B. Variation from Level: For bed joints and lines of exposed horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch in 40 feet (12 mm in 12 m) or more. For top surface of bearing walls, do not exceed 1/8 inch (3 mm) in 10 feet (3 m), nor 1/16 inch (1.5 mm) within width of a single unit.

C. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus: 1/4 inch (6 mm) nor plus 1/2 inch (12 mm).

D. Variation in Mortar-Joint Thickness: Do not vary from bed-joint thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm). Do not vary bed-joint thickness from bed-joint thickness of adjacent course by more than 1/8 inch (3 mm). Do not vary from head-joint thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary head-joint thickness from adjacent head-joint thickness by more than 1/8 inch (3 mm). Do not vary from collar-joint thickness indicated by more than minus 1/4 inch (6 mm) or plus 3/8 inch (10 mm).

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at comers, jambs, and where possible at other locations.

B. Lay walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

C. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corner or jambs.
   1. Flemish bond unless otherwise indicated.

D. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches (50 mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

E. Stopping and Resuming Work: In each course, rack back 1/2-unit length for one-half running bond or 1/3-unit length far one-third running bond; do not tooth. Clean expose if surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar prior to laying fresh masonry.

F. Built-in Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

3.5 MORTAR BEDDING AND JOINTING

A. Lay solid brick-size masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not furrow bed Joints or slush head joints.

B. Set stone units in full bed of mortar with vertical joints slushed full. Fill dowel, anchor, and similar holes solid. Wet stone-joint surface thoroughly before setting; for stone surfaces that are soiled, clean bedding and exposed surfaces with fiber brush and soap powder and rinse thoroughly with clear water.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

D. Provide Firestopping where required, as determined by DCAS in its sole discretion, in all fire rated brick masonry partitions.

3.6 BRICK PAVER INSTALLATION

A. Saturate concrete subbase with clean water several hours before placing setting bed. Remove surface water about one hour before placing setting bed.

B. Apply cement-paste slush coat over surface of concrete subbase about 15 minutes prior to placing setting bed. Limit area of slush coat to avoid its drying out prior to placing setting bed. Do not exceed 1/16-inch (l.6-mm) thickness for cement slush coat.

C. Apply mortar setting bed over cement-paste slush coat immediately after latter has been applied. Spread and screed setting bed to uniform thickness at subgrade elevations required for accurate setting of pavers to finished grades indicated.

D. Mix and place only that amount of mortar setting bed that can be covered with pavers prior to initial set. Cut back, bevel edge, remove, and discard setting-bed material that has reached initial set prior to placing pavers.
   1. Place reinforcing wire fabric over membrane protection course, lapped at joints by at least one full mesh and supported so that the mesh becomes embedded in the middle of setting bed. Do not bun edges against vertical surfaces.

E. Wet brick pavers prior to laying if the initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb the water so that they ate damp but not wet at the time of laying.

F. Place pavers before initial set of cement occurs. Immediately prior to placing pavers on green or wet setting bed, apply uniform 1/16-inch- (1.5-mm-) thick slurry bond coat to bed or to back of each paver with a flat trowel.

G. Tamp and beat pavers with a wooded block or rubber mallet to obtain full contact with setting bed and to bring finished surfaces within indicated tolerances: Set each paver in a single operation prior to initial set of mortar; do not return to areas already set and disturb pavers for purposes of realigning finished surfaces or adjusting joints.

H. Spaced joint Widths: Provide nominal joint width of 3/8 inch (10 mm), with variations no more than plus or minus 1/16 inch (1.5 mm).

I. Spaced Point Widths: Provide nominal joint width indicated with variations no more than plus or minus 1/8 inch (3 mm).

J. Grout joints as soon as possible after initial set of setting bed. Force grout into joints, taking care not to smear grout on adjoining pavers and other surfaces. After initial set of grout, finish joints by tooling to produce a slightly concave polished joint, free from drying cracks.

K. Cure grout by, maintaining in a damp condition for 7 days, except as otherwise recommended by

latex additive manufacturer.

3.7 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units; install in, fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point-up joints, including comers, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for application of sealants.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears prior to tooling joints.

D. Chemical Solutions or Liquid Detergent and Water:
   1. Prewet the masonry surfaces with water.
   2. Prepare cleaning solutions and operate pressure spray equipment in accordance with cleaning materials manufacturer's recommendations, unless otherwise indicated.
      a. Clean areas not accessible to spray equipment with bristle brushes.

E. Water Cleaning Methods:
   1. Low pressure (water soak) for limestone and marble.
   2. Medium pressure: Use 200 psi to 600 psi.
   3. Clean masonry equal in appearance to the approved sample panels.

F. Clean masonry free of dirt, grime, soot, carbon, efflorescence, moss, stains, graffiti, tendrils, and other foreign materials. Leave masonry uniformly clean and undamaged.

G. Clean all features and appurtenances of the masonry such as sills, arches, lintels, returns, reveals, projecting courses, coping, entablature work, back of parapets and balustrades, balconies, friezes, facias, cornices, chimneys and other features, except for those building features which are painted and are not included in the scope of work.

H. Thoroughly rinse off the masonry surfaces with water.

I. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
   1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
   2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain RE/PM’s approval of sample cleaning before proceeding with cleaning of masonry.
   3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
   4. Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
   5. Clean brick by bucket and brush hand-cleaning method described in BIA Technical Note No. 20 Revised, using the following masonry cleaner:

a. Job-mixed detergent solution.
b. Proprietary acidic cleaner, applied in compliance with directions of acidic cleaner manufacturer.

6. Clean limestone units to comply with recommendations in the "Indiana Limestone Handbook" of the Indiana Limestone Institute of America.

J. Protection: Provide final protection and maintain conditions that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

3.8 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

B. Unit Prices for brick partitions and paying shall include all required reinforcing, anchorage, attachments, accessories, grouts, firestopping mixtures, setting, cleaning, protection and any other items required to complete the installation.

END OF SECTION 042113

SECTION 044300
STONE MASONRY

PART 1 – GENERAL

1.1 SUMMARY

A. Work Included: Provide stone masonry work in accordance with the Contract Documents. This Section includes the following:
   1. Stone panels stone trim (such as decorative stone trim, cornice work, water table, base trim, etc.) and paving.

B. Related Sections include but not limited to the following:
   1. Division 5 Section “Metal Fabrications”
   2. Division 8 Section “Hollow Metal Doors and Frames”
   3. Division 4 Section “Masonry Cleaning”

1.2 SUBMITTALS

A. Product data for each different stone masonry unit accessory and other manufactured product specified.

B. Samples for verification of the following:
   1. Full-size units for each different exposed stone masonry unit required showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
   2. Accessories embedded in the masonry.
   3. Stone samples not less than 12 inches in length showing the full range of colors and textures expected in the finished construction.

C. Shop drawings for stone trim in the form of cutting and setting drawings showing sizes, profiles, and locations of each stone trim until required.

D. Calculations: Submit calculations for stone panel anchorage systems that are signed and sealed by a New York State licensed Professional Engineer and certified that anchorage system is in compliance with New York City Building Code.

E. Design stone anchors and anchoring systems according to ASTM C 1242 or New York City Building Code whichever is more stringent.

1.3 QUALITY ASSURANCE

A. Single-Source Responsibility for Stone Units: Obtain exposed stone units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one source and by a single manufacturer for each different product required.

B. Manufacturer Qualifications: A qualified manufacturer of cast-stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant

certified by the Cast Stone Institute, the Architectural Precast Association, or the Precast/Prestressed Concrete Institute for Group A, Category AT.

C. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

D. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

E. Mockup: Prior to installing stone, construct 2 feet by 2 feet sample wall panels to verify selections made under sample submittals and to demonstrate aesthetic effects of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.

1. Notify DCAS one week in advance of the dates and times when mockups will be constructed.
2. Protect accepted mockups from the elements with weather-resistant membrane.
3. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
    a. Acceptance of mockups is for color, texture, and blending of masonry units: relationship of mortar and sealant colors to masonry unit colors: tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by DCAS in writing.
    b. Acceptance of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by DCAS in writing.
    c. When directed demolish and remove mock-ups from Project site.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store stone and related materials on elevated platforms, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet do not install until they are in an air-dried condition.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained, and contamination avoided.

D. Store masonry accessories, including metal items to prevent corrosion and accumulation of dirt and oil.

E. Pack, handle, and ship cast-stone units in suitable packs or pallets.

1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast-stone units if required, using dollies with wood supports.
2. Store cast-stone units on wood skids or pallets with nonstaining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.

1.5 PROJECT CONDITIONS

A. Protection: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress:
   1. Extend cover a minimum of 24 inches (600 mm) down both sides and hold cover securely in place.

B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of stonework to be left exposed. Immediately remove grout, mortar, and soil that come in contact with such stonework.
   1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit masonry damaged by frost or freezing conditions. Comply with the following requirements:
   1. Cold-Weather Construction: When the ambient temperature is within the limits indicated use the following procedures:
      a. 40 to 32 deg F (4 to 0 deg C): Heat mixing water or sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C).
      b. 32 to 25 deg F (0 to -4 deg C): Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry.
      c. 25 to 20 deg F (-4 to -7 deg C): Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C): Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F (4 deg C) if grouting. Use heat on both sides of walls under construction.
      d. 20 deg F (-7 deg C) and Below: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F (4 deg C). Provide enclosures and use heat on both sides of walls under construction to maintain temperatures above 32 deg F (0 deg C) within the enclosure.
   2. Cold-Weather Protection: When the mean daily temperature is within the limits indicated provide the following protection:
      a. 40 to 25 deg F (4 to -4 deg C): Cover masonry with a weather-resistant membrane for 48 hours after construction.
      b. 25 to 20 deg F (-4 to -7 deg C): Cover masonry with insulating blankets or provide enclosure and heat for 48 hours after construction to prevent freezing. Install window breaks when wind velocity exceeds 15 mi./h (25 km/h).
      c. 20 deg F (-7 deg C') and Below: Provide enclosure and heat to maintain temperatures above 32 deg F (0 deg C) within the enclosure for 48 hours after construction.
   3. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried out, but not less than 7 days after completion of cleaning.

D. Hot-Weather Requirements: Protect stonework when temperature and humidity conditions produce

excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F (38 deg C) and above.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
   1. Portland Cement, Mortar Cement, Masonry Cement, and Lime:
      a. Essroc Materials, Inc.
      b. Glen-Gery Corporation.
      c. Lafarge Corporation.
      d. Lehigh Portland Cement Co.
      e. Riverton Corporation (The).
      f. Or an Approved Equal.
   2. Mortar Pigments:
      a. Davis Colors.
      b. Lafarge Corporation.
      c. Solomon Grind-Chern Services, Inc.
      d. Or an Approved Equal.
   3. Joint Reinforcement, Ties, and Anchors:
      a. Dur-O-WaC Inc.
      b. Masonry Reinforcing Corp. of America.
      c. National Wire Products Industries.
      d. Or an Approved Equal.

2.2 STONE

A. Limestone: Indiana oolitic limestone as quarried in Lawrence, Monroe, and Owen counties, Indiana: complying with AS1M C 568, Category II (medium density): and matching standards of the Indiana Limestone Institute of America (ILI) for the following:
   1. Grade and Color: Select, buff and matching adjacent building.
   2. Finish: Sawn.

B. Bluestone: ASTM C 616, and equal to North River Bluestone as manufactured by Heldaberg Bluestone and Marble or an Approved Equal.
   1. Finish: Natural cleft face with diamond rubbed finish unless otherwise indicated.
   2. Color: Light grey-blue.

C. Cut stone accurately to shape and dimensions indicated, with exposed faces dressed true, beds, and joints at right angles to face: comply with ILI and NBGQA fabricating tolerances.

2.3 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150. Type I or II except Type III may be used for cold- weather

construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Masonry Cement: ASTM C 91.
   1. For pigmented mortars use premixed, colored masonry cements of formulation required to produce color indicated, or if not indicated, as selected from manufacturer's standard formulations. Pigments shall not exceed 5 percent of masonry cement by weight for mineral oxides nor 1 percent for carbon black.
   2. For colored-aggregate mortars, use masonry cement of natural color or white as required to produce mortar color indicated.

C. Hydrated Lime: ASTM C 207, Type S.

D. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150 Type I or Type III, and hydrated lime complying with ASTM C 207.
   1. For pigmented mortars, use colored portland cement-lime mix of formulation required to produce color indicated, or if not indicated, as selected from manufacturer's standard formulations. Pigments shall not exceed 10 percent of portland cement by weight for mineral oxides nor 2 percent for carbon black.

E. Aggregate for Mortar: ASTM C 144: except for joints less than 1/4 inch (6.5 mm), use aggregate graded with 100 percent passing the No. 16 (1.18 mm) sieve.
   1. White-Mortar Aggregates: Natural white sand or ground white stone.
   2. Colored-Mortar Aggregates: Natural-colored sand or ground marble, granite, or other sound stone, as required to match DCAS's sample.

F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.

G. Cold-Weather Admixture: Non-chloride, non-corrosive, accelerating admixture complying with ASTM C 494, Type C. and recommended by the manufacturer for use in masonry mortar of composition indicated.

H. Water: Potable.

I. Available Products: Subject to compliance with requirements products that may be incorporated in the Work include but are not limited to the following:
   1. Colored Masonry Cement:
      a. Brixment-in-Color; Essroc Materials, Inc.
      b. Centurion Colorbond; Lafarge Corporation.
      c. Lehigh Custom Color Masonry Cement; Lehigh Portland Cement Co.
      d. Flamingo Color Masonry Cement; Riverton Corporation (The).
      e. Or an Approved Equal.
   2. Colored Portland Cement-Lime Mix:
      a. Color Mortar Blend; Glen-Gery Corporation.
      b. Centurion Colorbond PL; Lafarge Corporation.
      c. Lehigh Custom Color Portland/Lime; Lehigh Portland Cement Co.

d. Riverton Portland Cement Lime Custom Color; Riverton Corporation (The).
e. Or an Approved Equal.

3. Mortar Pigments:
   a. True Tone Mortar Colors; Davis Colors.
   b. Centurion Pigments; Lafarge Corporation.
   c. SGS Mortar Colors; Solomon Grind-Chern Services, Inc.
   d. Or an Approved Equal.
4. Cold-Weather Admixture:
   a. Accelguard 80; Euclid Chemical Co.
   b. Morsel; Grace; W.R. Grace & Co.
   c. Or an Approved Equal.
5. Water-Repellent Admixture:
   a. Dry-Block Mortar Admixture; Grace; W.R. Grace & Co.
   b. Or an Approved Equal.

J. Latex additive (water emulsion) described below serving as replacement for part or all gaging water, of type specifically recommended by latex additive manufacturer for use with job-mixed portland cement and aggregate and not containing a retarder.
   1. Latex Additive: Acrylic resin.

2.4. TIES AND ANCHORS, GENERAL

A. Fabricate anchors, including cramps, dowels; and shelf angles, from stainless steel, ASTM A 666, Type 304, temper as required to support loads imposed without exceeding allowable design stresses. Fasteners for Stainless-Steel Anchors: Annealed stainless-steel bolts, nuts, and washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group IAI.

2.5 MISCELLANEOUS ANCHORS

A. Dowels and Anchors: Provide dowels and attachments of type and size required to support stonework and fabricated from the following metals for conditions and anchors indicated below:
   1. Stainless Steel, AISI Type 304, for anchors in direct contact with stone.

2.6 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Type 2, Class A, Grade 1; compressible up to 35 percent; of width and thickness as required; formulated from the following material:
   1. Neoprene.
   2. Urethane.
   3. Polyvinyl chloride.

2.7 MASONRY CLEANERS

A. Job-Mixed Detergent Solution: Solution of 1/2-cup (0.14-L) dry measure tetrasodium polyphosphate and 1/2-cup (0.14-L) dry measure laundry detergent dissolved in 1 gal. (4 L) of

water.

B. Proprietary Acidic Cleaner: Manufacturer's standard-strength, general-purpose cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry surfaces of type indicated below without discoloring or damaging masonry surfaces; expressly approved for intended use by manufacturer of masonry units being cleaned.
   1. For masonry not subject to metallic oxidation stains, use formulation consisting of a concentrated blend of surface-acting acids, chelating, and wetting, agents.
   2. For dark-colored masonry not subject to metallic oxidation stains, use formulation consisting of a liquid blend of surface-acting acids and special inhibitors.
   3. For masonry subject to metallic oxidation stains, use formulation consisting of a liquid blend of organic and inorganic acids and special inhibitors.
   4. Available Products: Subject to compliance with requirements, products that may be used to clean unit masonry surfaces include, but are not limited to, the following:
      a. 202 New Masonry Detergent; Diedrich Technologies, Inc.
      b. 200 Lime Solv; Diedrich Technologies, Inc.
      c. 202V Vana-Stop; Diedrich Technologies, Inc.
      d. Sure Klean No. 600 Detergent; ProSoCo, Inc.
      e. Sure Klean No. 101 Lime Solvent; ProSoCo., Inc.
      f. Sure Klean Vana Trol; ProSoCo, Inc.
      g. Or an Approved Equal.

2.8 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.
   2. Add cold-weather admixture (if used) at the same rate for all mortar, regardless of weather conditions, to ensure that mortar color is consistent.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification, for types of mortar indicated below:
   1. Limit cementitious materials in mortar to portland cement and lime. Type: S.

C. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required.
   1. Limit pigments to the following percentages of cement content by weight:
      a. For mineral oxide pigments and portland cement-lime mortar, not more than 10 percent.
      b. For carbon-black pigment and portland cement-lime mortar, not more than 2 percent.
      c. For mineral oxide pigments and masonry cement mortar, not more than 5 percent.
      d. For carbon-black pigment and masonry cement mortar not more than 1 percent.

D. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates combined with selected cementitious materials.

1. Mix to match existing adjoining mortar.

E. Latex-Modified Portland Cement Setting-Bed Mortar: Proportion and mix Portland cement, aggregate, and latex additive for setting bed to comply with directions of latex additive manufacturer and as necessary to produce stiff mixture with a moist surface when bed is ready to receive pavers.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of unit masonry. Do not proceed with installation until unsatisfactory conditions have been corrected. For the record prepare written report, endorsed by Installer, listing conditions detrimental to performance of unit masonry.

B. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.

3.2 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of columns, walls, and arrises, do not exceed 1/4 inch in 10 feet (6 mm in 3 m), nor 3/8 inch in 20 feet(1 0 mm in 6 m), nor 1/2 inch in 40 feet (12 mm in 12 m) or more. For external comers, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch in 40 feet (12 mm in 12 m) or more. For vertical alignment of head joints, do not exceed plus or minus 1/4 inch in 10 feet (6 mm in 3 m), nor 1/2 inch (12 mm) maximum.

B. Variation from Level: For bed joints and lines of exposed horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch in 40 feet (12 mm in 12 m)or more. For top surface of bearing walls, do not exceed 1/8 inch (3 mm) in 10 feet (3 m), nor 1/16 inch (1.5 mm) within width of a single unit.

C. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4 inch (6 mm) nor plus 1/2 inch (12 mm).

D. Variation in Mortar-Joint Thickness: Do not vary from bed-joint thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm). Do not vary bed-joint thickness from bed-joint thickness of adjacent course by more than 1/8 inch (3 mm). Do not vary from head-joint thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary head-joint thickness from adjacent head-joint thickness by more than 1/8 inch (3 mm). Do not vary from collar-joint thickness indicated by more than minus 1/4 inch (6 mm) or plus 3/8 inch (10 mm).

3.3 MORTAR BEDDING AND JOINTING

A. Set stone units in full bed of mortar with vertical joints slushed full. Fill dowel, anchor, and similar holes solid. Wet stone-joint surface thoroughly before setting; for stone surfaces that are soiled,

clean bedding and exposed surfaces with fiber brush and soap powder and rinse thoroughly with clear water.

B. Tool exposed joints slightly concave when thumbprint hard using a jointer larger than joint thickness, unless otherwise indicated.

3.4 SETTING STONE

A. Execute stonework by skilled mechanics and employ skilled stone fillers at the site to do necessary field cutting as stones are set.
   1. Where field culling is required use power saws to cut stones; for exposed edges, produce edges which are cut straight and true.

B. Contiguous Work: Provide chases, reveals, reglets, openings and other spaces as indicated for accommodating contiguous work. Close-up openings in stonework after other work is in place with stonework which matches that already set. Build in stainless steel flashing and weep holes.

C. Set stones to comply with requirements indicated on drawings and final shop drawings. Install anchors, supports, fasteners and other attachments indicated or necessary to secure stonework in place. Shim and adjust anchors, supports and accessories to set stones accurately in locations indicated with uniform joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerances.

D. Construction Tolerances: Set stones to comply with the following tolerances:
   1. Variation from Plumb: For lines and surfaces and arrises, do not exceed 1/4” in 10”.
   2. Variation from Level: For grades indicated for horizontal grooves and other conspicuous lines, do not exceed 1/2” in any bay or 20’ maximum, nor 3/4” in 40’ or more.
   3. Variation of Linear Building Line: For position shown in plan, do not exceed 1/2” in any bay or 20” maximum, nor 3/4” in 40’ or more.
   4. Variation in Cross-Sectional Dimensions: From dimensions indicated, do not exceed minus 1/4”, nor plus 1/2”.

E. Provide expansion joints, control joints and pressure relieving joints of widths and at locations indicated.
   1. Sealing expansion and other joints is specified in Division-7 Section “Joint Sealers.”
   2. Do not fill with mortar.

F. Wet stones which are dry at time of selling by drenching or sponging them with water.

G. Set stones in full bed of mortar with vertical joints slushed full, unless otherwise indicated.
   1. Place selling buttons of adequate size, in sufficient quantity, and of same thickness as indicated joint width, to prevent mortar from squeezing out and to maintain uniform joint widths. Hold buttons at least one joint width back from face of stones.
   2. Do not set heavy stones or projecting courses until mortar in courses below has hardened sufficiently to resist being squeezed out of joint.
   3. Fill anchor holes with mortar.

H. Rake out mortar from joints to depths equal to 2-1/2 times their widths but not less than 1/2” nor

less than that required to expose sound mortar for joints pointed with mortar, or to provide sufficient depth for sealant and sealant backing for joints pointed with sealants.

I. Prepare stone joint surfaces for pointing with mortar by removing dust and mortar particles. Where selling mortar was removed to depths greater than surrounding areas, apply first layer of pointing mortar in layers not greater than 3/8" until a uniform depth is formed; compact each layer thoroughly and allow to become thumbprint hard before applying next layer.

J. Point stone joints by placing pointing mortar in 3 layers with each of first- and second-layers filling approximately two-fifths of joint depth and third layer remaining one-fifth. Fully compact each layer and allow to become thumbprint hard before applying next layer.

K. Tool joints with a round joiner having a diameter 1/8" larger than width of joint, when pointing mortar is thumbprint hard.

3.5 STONE PAVER INSTALLATION

A. Saturate concrete subbase with clean water several hours before placing setting bed. Remove surface water about one hour before placing setting bed.

B. Apply cement-paste slush coat over surface of concrete subbase about 15 minutes prior to placing setting bed. Limit area of slush coat to avoid its drying out prior to placing setting bed. Do not exceed 1/16-inch (1.6-mm) thickness for cement slush coat.

C. Apply mortar setting bed over cement-paste slush coat immediately after latter has been applied. Spread and screed setting bed to uniform thickness at sub grade elevations required for accurate setting of pavers to finished grades indicated.

D. Mix and place only that amount of mortar setting bed that can be covered with pavers prior to initial set. Cut back, bevel edge, remove, and discard setting-bed material that has reached initial set prior to placing pavers.

E. Wet pavers prior to laying if the initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb the water so that they are damp but not wet at the time of laying.

F. Place pavers before initial set of cement occurs. Immediately prior to placing pavers on green or wet setting bed, apply uniform 1/16-inch- (1.5-mm-) thick slurry bond coat to bed or to back of each paver with a flat trowel.

G. Tamp and beat pavers with a wooden block or rubber mallet to obtain full contact with setting bed and to bring finished surfaces within indicated tolerances. Set each paver in a single operation prior to initial set of mortar; do not return-to areas already set and disturb pavers for purposes of realigning finished surfaces or adjusting joints.

H. Spaced Joint Widths: Provide nominal joint width of 3/8 inch (10 mm), unless otherwise indicated, with variations not exceeding plus or minus 1/16 inch (1.5 mm).

I. Grout joints as soon as possible after initial set of setting bed. Force grout into joints, taking care

not to smear grout on adjoining pavers and other surfaces. After initial set of grout, finish joints by tooling to produce a slightly concave polished joint, free from drying cracks.

J. Cure grout by maintaining in a damp condition for 7 days except as otherwise recommended by latex additive manufacturer.

3.6 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units; install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point-up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for application of sealants.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears prior to tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
   1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
   2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain DCAS's approval of sample cleaning before proceeding with cleaning of masonry.
   3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent. Polyethylene film, or waterproof masking tape.
   4. Wet wall surfaces with water prior to application or cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
   5. Clean limestone units to comply with recommendations in the "Indiana Limestone Handbook" of the Indiana Limestone Institute of America.

E. Protection: Provide final protection and maintain conditions that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

F. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.

G. In-Progress Cleaning: Clean cast stone as work progresses.
   1. Remove mortar fins and smears before tooling joints.
   2. Remove excess sealant immediately, including spills, smears, and spatter.

H. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:
   1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
   2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast

stone.

3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
5. Clean cast stone by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean cast stone with proprietary acidic cleaner applied according to manufacturer's written instructions.

3.7 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

B. Unit prices shall include all ties, anchors, mortar, setting, grout, jointing and any other items required for a complete installation including edge treatment of panels, paving, trim and curbs.

END OF SECTION 044300

SECTION 045200
MASONRY CLEANING

PART 1 – GENERAL

1.1 SUMMARY

A. Work included: Provide all labor and materials for interior and exterior masonry cleaning in accordance with the Contract Documents. The Work of this Section shall include but not be limited to the following:
   1. General cleaning of brick masonry using chemical cleaners and pressurized water rinse.
   2. General cleaning of interior stone masonry using chemical cleaners and pressurized water rinse.
   3. General cleaning of granite or sandstone masonry using chemical cleaners and pressurized water rinse.
   4. Clean biological growth from exterior masonry using chemical cleaners, biocides, and low-pressure water rinses.
   5. Remove efflorescence and gypsum crusts from masonry using poultices and water misting.
   6. Protect pedestrian and vehicular traffic, adjacent materials and buildings, and building occupants and contents during cleaning.
   7. Collect and properly dispose of all solid and liquid wastes in accordance with current governmental regulations.
   8. Comply with OSHA, EPA, and NYC DEP regulations.
   9. Clean all masonry and stone surfaces as directed by DCAS or the DCAS representative. Surfaces shall include but not limited to walls, floors, ceilings, trim, baseboards, etc.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 4 “Maintenance of Masonry” – 040100
   2. Division 4 “Maintenance of Stone Assemblies” – 040140
   3. Division 4 “Unit Masonry” – 042000
   4. Division 4 “Brick Masonry” – 042113
   5. Division 4 “Stone Masonry” – 044300

1.2 QUALITY ASSURANCE

A. All work shall be performed by skilled workers. The Contractor or sub-contractor performing the work of this section must have recently completed masonry cleaning projects similar in scope, material, and extent to those indicated by this section, and whose work has resulted in construction with a record of successful in-service performance (i.e. masonry cleaning on buildings that are landmark, landmark quality or buildings of equivalent historical or architectural significance).

B. The Contractor shall maintain a steady work crew made up of qualified workers and a full-time foreman who reads and speaks fluent English. The Contractor shall confirm that all workers understand the job’s requirements.

C. Cleaning Standard: The Contractor shall prepare sample panels for approval by DCAS which shall

form a standard for general masonry restoration and cleaning.

1. No test panels shall be made until the methods and locations are approved by DCAS.

D. Masonry cleaning shall be completed using approved methods which result in no damage to the historic masonry of the building, nor result in an excessively clean appearance.

E. Materials and methods shall conform to the "The Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings."

F. Paint-Remover Manufacturer Qualifications: A firm regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory-authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.

G. Chemical-Cleaner Manufacturer Qualifications: A firm regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory-authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.

H. Cleaning Program: Prepare a written cleaning program that describes cleaning process in detail, including materials, methods, and equipment to be used; protection of surrounding materials; and control of runoff during operations. Include provisions for supervising worker performance and preventing damage.

1. If materials and methods other than those indicated are proposed for any phase of cleaning work, add a written description of such materials and methods, including evidence of successful use on comparable projects and demonstrations to show their effectiveness for this Project

1.3 DEFINITIONS

A. Very Low-Pressure Spray: Under 100 psi (690 kPa).

B. Low-Pressure Spray: 100 to 400 psi (690 to 2750 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).

C. Medium-Pressure Spray: 400 to 800 psi (2750 to 5510 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).

D. High-Pressure Spray: 800 to 1200 psi (5510 to 8250 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).

1.4 SEQUENCING AND SCHEDULING

A. Work Sequence: Perform masonry-cleaning work in the following sequence:

1. Remove plant growth.
2. Inspect for open mortar joints. Where repairs are required, delay further cleaning work until after repairs are completed, cured, and dried to prevent the intrusion of water and other cleaning materials into the wall.
3. Remove paint.

4. Clean masonry surfaces.
5. Where water repellents are to be used on or near masonry, delay application of these chemicals until after cleaning.

B. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in masonry units according to masonry repair Sections. Patch holes in mortar joints according to masonry repointing Sections.

1.5 TESTING AND MOCK-UPS

A. Test Panels: Test panels for each cleaner, procedure and substrate specified herein will be prepared on wall surfaces ranging from one (1) square foot to twenty-five (25) square feet in area, at locations to be selected by DCAS.
   1. DCAS will be present during the creation of all test panels. Do not proceed with the work unless DCAS is present. Notify DCAS not less than forty-eight (48) hours in advance. Provide scaffolding as necessary for DCAS's close-up inspection of the test panels.
   2. Provide protection during the testing phase.
   3. All procedures, dwell times, concentrations, dilutions, and materials are subject to modification by DCAS during the testing process. DCAS will choose products to be used for cleaning the entire building based on the results of the test panels. Modifications of sequence, chemical dilution, substitute reagents, and equivalent procedures shall be executed at no additional cost to the City.
   4. After the test panels are complete, wait seven (7) or more calendar days to allow for thorough drying prior to final evaluation.
   5. Repeat demonstrations and testing procedures until DCAS's requirements are satisfied.

B. No test panels shall be made until the methods and locations are approved by DCAS.

C. Field-Construction Mock-Ups: After the completion of the testing phase, and before general masonry cleaning begins, prepare mock-up panels on the building, as indicated, where directed by DCAS. Obtain DCAS's written acceptance of visual qualities before proceeding with the work. Retain the approved panels, undisturbed and suitably marked, throughout construction, as a standard for judging completed work.
   1. Mock-ups must be approved before the general work begins. The Contractor shall repeat samples until approved by DCAS. Upon approval, the test panels will remain the standard throughout the job and shall remain intact at the job site as a point of reference until the work of this section has been approved and accepted.
   2. Provide protection during the mock-up phase.
   3. All mock-ups will be a minimum of 5'-0" x 5'-0" except where specifically approved by DCAS.
   4. Mock-ups shall be performed by the same foreman and workmen completing the general work.
   5. All procedures, dwell times, concentrations, dilutions, and materials are subject to modification during the mock-up process. DCAS will modify the procedures as required for subsequent work. Modifications of sequence, chemical dilution, substitute reagents, and equivalent procedures shall be executed at no additional cost to the City.

1.6 SUBMITTALS

A. General: Submit the following in accordance with the provisions of the General Conditions.

B. Qualification Data: Submit qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Bidders shall visit the site and make themselves familiar with job conditions.

C. Product Literature: The Contractor shall submit copies of the manufacturer's technical data for each product including their recommendations for application and use. Include test reports and certificates that verify the product's compliance with the specification's requirements.

1. On Site Copy of Product Literature: one complete set of product literature shall be placed in a 3-ring, loose-leaf binder and shall be always present on the job site for the reference of DCAS.

D. Test Panels: Test panels for each cleaner, procedure and substrate specified herein will be done on wall surfaces ranging from one (1) square foot up to and including areas of twenty-five (25) square feet, at the discretion of DCAS and at locations to be selected by said DCAS.

1. DCAS will be present during the creation of all test panels. Do not proceed with the work unless DCAS is present. Notify DCAS not less than forty-eight (48) hours in advance. Provide scaffolding as necessary for DCAS's close-up inspection of the test panels.
2. Provide protection during the testing phase.
3. All procedures, dwell times, concentrations, dilutions, and materials are subject to modification by DCAS during the testing process. DCAS will choose products to be used for cleaning the entire building based on the results of the test panels. Modifications of sequence, chemical dilution, substitute reagents, and equivalent procedures shall be executed at no additional cost to the City.
4. After the test panels are complete, wait seven (7) or more calendar days to allow for thorough drying prior to final evaluation.
5. Repeat demonstrations and testing procedures until DCAS's requirements are satisfied.

E. Methods of Protection: Before cleaning operations begin, the Contractor shall submit to DCAS a written description of the proposed materials and methods of protection. Protection is required for, but not limited to, the following: All metal, painted surfaces, wood, window glass, awnings and canopies, building occupants, pedestrian and vehicular traffic, plants and lawns, and nearby property and materials.

F. Waste Disposal Program: Before cleaning operations begin, the Contractor shall submit a written description of the proposed collection and disposal methods for each type of solid and liquid by-product generated during masonry cleaning.

G. Field-Construction Mock-Ups: When directed by the Architect or DCAS, after the completion of the testing phase, and before general masonry cleaning begins, prepare mock-up panels on the building, as indicated, where directed by DCAS. Obtain the DCAS's written acceptance of visual qualities before proceeding with the work. Retain the approved panels, undisturbed and suitably marked, throughout construction, as a standard for judging completed work.

1. Mock-ups must be approved before the general work begins. The Contractor shall repeat samples until approved by DCAS. Upon approval, the test panels will remain the standard

throughout the job.

2. Provide protection during the mock-up phase.
3. All mock-ups will be a minimum of 5’-0” x 5’-0” except where specifically approved by DCAS.
4. Mock-ups shall be performed by the same foreman and workmen completing the general work.
5. All procedures, dwell times, concentrations, dilutions, and materials are subject to modification during the mock-up process. DCAS will modify the procedures as required for subsequent work. Modifications of sequence, chemical dilution, substitute reagents, and equivalent procedures shall be executed at no additional cost to the City.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the site in the manufacturer’s original, unopened containers and packaging, bearing product labels as to type, name, and manufacturer.

1.8 PROJECT CONDITIONS

A. Visitors to, and users of, the building, general pedestrian traffic and vehicular traffic shall be protected from all cleaning materials and their by-products, including liquids, solids, rinse water, overspray, and wind-carried spray. Cleaning materials may be harmful to people, materials, and animals.

B. Protection of Materials:
   1. Protect, using extreme care, surrounding materials, buildings, plants, lawns, and landscape materials. Products used for cleaning stone may be harmful to metal, glass, and plants. Any damage to materials caused by the cleaning process is unacceptable and shall be repaired to the satisfaction of DCAS at no cost to the City.
   2. Provide protection from water damage to the building, its structure, and its contents.

C. Windows: The Contractor shall completely protect windows to remain, including sealant beads between frame and masonry opening and metal grilles, for the duration of the work. Any damage to windows shall be repaired by the Contractor to the complete satisfaction of DCAS at no additional cost to the City.

1.9 ENVIRONMENTAL CONDITIONS

A. Clean masonry surfaces only when the air temperatures are forecast to remain above 40 deg. F (4 deg. C) for seven (7) or more days.

B. No work shall begin when any part of the wall or materials are frozen or subject to freezing.

1.10 COLLECTION AND DISPOSAL OF WASTE PRODUCTS

A. General: Collect, test, and dispose of solid and liquid wastes in accordance with all applicable local, state, and federal regulations. Observe “Rules and Regulations Relating to the Use of the Public Sewers, Including Sewer Surcharges” as published by the New York City Department of

Environmental Protection, Industrial Waste Control Section.

1. Protection and waste collection systems shall be in place before general cleaning begins.
2. Test all drains and other water removal systems to assure that drains and systems are functioning properly before cleaning operations begin. Notify DCAS immediately if any drains or system are stopped or blocked. The contractor shall repair drains if so directed by DCAS. Do not begin the work of this Section until the drains are in good working order.
3. Provide a method to prevent solids such as masonry residue tram entering the drains and drain lines. The Contractor shall be responsible for cleaning out any rain or drain line that becomes blocked or filled with sand or other solids because of work performed under this Contract.

PART 2 – PRODUCTS

2.1 CLEANING MATERIALS

A. General: Chemical materials shall be safe for use and not in violation of City, State, or Federal regulations.

B. Water for Cleaning: Potable.

C. Cleaner for interior marble shall be “Liquid Marble Cleaner,” manufactured by ProSoCo, Inc., Kansas City, KS, Or an Approved Equal.

D. Products for brick, granite, and sandstone masonry cleaning are as the following:
   1. “HydroClean HT-626 Brick, Granite, Sandstone and Terra Cotta Cleaner” manufactured by Hydrochemical Techniques, Inc., Hartford, CT (203) 527-6350.
   2. “Sure Clean Restoration Cleaner” manufactured by ProSoCo, Inc. Kansas City, KS.
   3. “Heavy Duty Restoration Cleaner” manufactured by ProSoCo; Inc. Kansas City, KS.
   4. “Bac 2 Nu” manufactured by Chemique, Inc., Moorestown, NJ (800) 225-4161.
   5. Or an Approved Equal.

E. Detergent cleaner shall be KRC Jon 417, available from Chemique, Inc., Moorestown, NJ, Or an Approved Equal.

F. Poultice shall be “MasonRE Pad Mark Remover and Poultice” by Cathedral Stone Products, Inc., Hanover, Maryland or “Marble Poultice, Marble Poultice Additive,” and “TI 087 Special Poultice Additive,” manufactured by ProSoCo, lnc., Kansas City, KS, Or an Approved Equal.

G. Biological Growth Remover: “Biological Stain Remover”, by ProSoCo, Inc., Or an Approved Equal.

H. Biocide: Concentrated solution of Hydrogen Peroxide in water.

2.2 CLEANING EQUIPMENT

A. Pressure pumps: All pumps shall be equipped with working pressure gauges. Any pump found to

be without working pressure gauges shall be removed from the site and work will cease until pump has been replaced with pump having working pressure gauge.

B. Brushes: Fiber bristle only.

2.3 MIXING CHEMICAL CLEANING SOLUTIONS

A. General: Chemical cleaning materials are to be diluted according to the results obtained through the test mock-ups. The manufacturer's recommended dilutions may be modified to reflect the results of field mock-ups.

B. Testing panels shall be created using a minimum of two (2) dilutions for each product where dilution is recommended by the manufacturer or requested by DCAS.

PART 3- EXECUTION

3.1 PREPARATION

A. General: Comply with chemical manufacturer's recommendations for protecting building surfaces against damage from exposure to their products.

B. Protect pedestrians, motor vehicles, surrounding surfaces of buildings whose masonry surfaces are being cleaned, building site, and surrounding buildings from injury resulting from masonry cleaning work.
   1. Prevent chemical cleaning solutions from contacting pedestrians, motor vehicles, landscaping, buildings and other surfaces.
   2. Do not clean masonry when winds are of sufficient force to spread cleaning solutions to unprotected surfaces.
   3. Erect temporary protection over, pedestrian walkways and over areas where people and vehicles enter and exit the building.

C. Protect glass, unpainted metals, and polished stone from acidic chemical cleaners by covering them with strippable masking or polyethylene film and waterproof masking tape. Apply masking agent according to the manufacturer's recommendations. Do not apply liquid masking agent to painted or porous surfaces.

D. Protect unpainted metal from alkali cleaners by covering them with polyethylene film and waterproof masking tape.

E. Dispose of cleaning run-off by legal means which prevent erosion, undermining, damage to plant material, and water penetration into the building. Dispose of toxic and hazardous wastes as specified in Part 1 of this Section, in accordance with current governmental regulations (OSHA, EPA and NYC DEP).

F. All joints and cracks in masonry must be watertight before starting any work with water. Provide temporary seal for all joints and cracks to prevent water infiltration as directed by DCAS. All caulking and sealing required shall be completed before this cleaning operation begins. Grout and

repair masonry or stone where needed and/ or as directed.

G. Carefully remove and safely store all surface mounted furnishings, and signs as directed by DCAS. Cleaning shall be done behind all surface mounted items as directed. Upon completion of cleaning, re-secure, re-install and/ or re-place all items in their original location and position.

H. Provide all labor and materials for scaffolding, ladders or other equipment necessary to perform the cleaning work and be responsible for the securing, safety and sufficiency thereof. The furnishing of all scaffolding, ladders and other equipment necessary to perform the cleaning work shall be deemed included in the Unit Price.

I. The Contractor shall take all necessary precautions to protect all the adjoining surfaces, and will be held responsible for any such damage and repair at his own expense.

3.2 CLEANING MASONRY, GENERAL

A. Do not begin cleaning until DCAS approves the cleaning technique.

B. Begin each cleaning process in DCAS's presence.

C. Clean in an orderly manner:
   1. Do not allow products to dry out on masonry surfaces.
   2. Protect surfaces located below from acidic cleaners and related rinse waters.

D. Use only those cleaning methods approved by DCAS. The use of wire brushes or steel wool will not be permitted anywhere on the building.

E. Cleaning of masonry other than limestone will generally be accomplished with One-Part chemical cleaners. Extremely heavily soiled masonry may require Two-Part chemical cleaning systems.

F. Cleaning of sandstone may require Two-Part chemical cleaners consisting of a prewash/after wash system. Heavily soiled limestone may require more aggressive components.

G. Apply each cleaner uniformly to all surfaces, including comers, moldings, interstices. Produce an overall even effect without streaking or damaging the masonry surfaces.

H. Rinse chemical residue and soil by working upwards from the bottom to the top of each treated area. Test rinsed surfaces with litmus papers to ensure that all chemicals have been removed from the surface of the masonry.

3.3 WATER APPLICATION METHODS

A. Rinsing: Spray water on masonry surfaces as indicated for location, purpose, water temperature, pressure, volume, and equipment. Unless otherwise indicated, bold spray nozzle not less than 12" from the masonry surface and spray from side to side in overlapping bands to produce uniform coverage and an even effect.

1. Low Pressure Spray: Not more than 300 psi; 3 to 6 gallons per minute, with a 15- 20-degree fan tip.

B. Filter all water for rinsing through a 5-micron particulate filter placed in line of water. Replace filter daily or as required, whichever is more frequent.

3.4 CHEMICAL CLEANING

A. General: Apply chemical cleaners to masonry surface according to the manufacturer's recommendations using brush or spray, application methods, at the Contractor's option, unless otherwise indicated. Do not allow the chemicals to remain on the surfaces for periods longer than determined by the field mock-ups or recommended by the manufacturer. Only the chemical cleaners approved for use at the conclusion of the mock-up phase shall be used for general cleaning.

B. Spray Application: Apply chemicals at pressures not exceeding 50 psi, unless recommended by the manufacturer.

C. One-part Chemical Cleaning of Masonry: Clean masonry surfaces with one-part systems using chemical cleaners of dilution indicated, and applied as follows:
1. Prewet masonry surface using a low-pressure cold-water spray.
2. Apply cleaner to masonry with a brush or roller. Let the cleaner remain on the surface for period recommended by cleaner manufacturer or as determined by the field testing.
3. Pressure rinse masonry with cold water spray to remove chemicals and soil.
4. Repeat the cleaning process until the area meets the standards set by approved mock-up panel. Do not apply more than twice or as determined by the approved field mock-up panel.
5. Scrub heavily stained areas with a natural fiber brush and specified cleaner diluted as determined by DCAS.
6. Test rinsed surfaces with litmus papers to ensure that all chemicals have been removed from the surface.

D. Two-part Chemical Cleaning of Masonry: Clean masonry surfaces with two-part systems using chemical cleaners of dilution indicated, and applied as follows:
1. Prewet masonry surface using a low-pressure cold-water spray.
2. Apply alkaline cleaner or prewash to masonry with a brush or roller. Let the cleaner remain on the surface for period recommended by cleaner manufacturer or as determined by DCAS.
3. Pressure rinse masonry with cold water spray to remove chemicals and soil.
4. Apply acidic cleaner as after wash to damp masonry using low pressure spray, deep nap roller, or soft fiber brush. Let cleaner remain on the surface for a period recommended by the cleaner manufacturer or as determined by testing.
5. Pressure rinse masonry with cold water spray to remove chemicals and soil.
6. Repeat the cleaning process until the area meets the standards set by approved mock-up panel. Do not apply more than twice or as determined by DCAS.
7. Scrub heavily stained areas with a natural fiber brush and specified cleaner in a dilution of one part water to one-part chemical cleaner concentrate or as determined by DCAS.

8. Test rinsed surfaces with litmus papers to ensure that all chemicals have been removed from the surface.

E. The Contractor shall repeat the chemical cleaning process in heavily soiled locations.

3.5 BIOLOGICAL GROWTH REMOVAL

A. General: Perform biological growth removal immediately following final rinsing of masonry surfaces.

B. Remove all plant, fungus, algae, and lichen growth by brushing with dry natural bristle brushes and scraping with plastic or wooden implements. Do not use metal tools in this process.

C. Apply biological growth remover diluted to manufacturers printed instructions, applied as follows:
1. Brush or low-pressure spray apply. Coordinate application so that sodium hypochlorite is applied when surface is still wet from final rinsing for general cleaning of masonry surfaces.
2. Allow to remain on the surface for five (5) minutes.
3. Rinse surface thoroughly.

D. Apply the biocide. Allow to dwell for one hour. Repeat the application.
1. Thoroughly rinse the masonry surfaces where the biocide has been applied with medium pressure water (400 psi) for a minimum of five minutes.

3.6 EFFLORESCENCE REMOVAL METHOD

A. Remove efflorescence from masonry by brushing with dry, soft, natural bristle brushes. Do not wet wall before brushing.

B. Remove remainder of efflorescence by poultice cleaning.

3.7 POULTICE CLEANING

A. General: Perform poulticing in areas determined by DCAS in conjunction with the cleaning contractor. The intention is to remove efflorescence from masonry surfaces.

B. Cleaning with poultice:
1. Remove surface efflorescence using a dry natural fiber bristled brush.
2. Slowly mix clay with water to form a paste or cream.
3. Apply by airless spray or stainless steel, wood or plastic trowel to form a 1/4” thick coating.
4. Cover with lightweight polyethylene film. Press film into poultice and tape edges.
5. Let stand for 12-24 hours or time determined by DCAS.
6. Remove film and poultice. Rinse with low pressure water.
7. Repeat process as determined by DCAS.

3.8 INTERIOR MASONRY CLEANING METHODS

A. General Protection Methods:
   1. Provide gutters and troughs to intercept and redirect water at walls if deemed necessary by DCAS.
   2. Provide protection to adjacent finishes and materials, building occupants and contents as required.
   3. The Contractor shall be responsible for the installation, removal and disposition of all necessary masking, temporary caulking, gutters, troughs, containers, etc., for completion of the cleaning operation.
   4. All necessary measures shall be taken to protect all parts of the building not being cleaned (e.g. window frames, metal grilles paint and plaster finishes. etc.) from the cleaning process.

B. General Cleaning Method:
   1. Cleaning shall include the removal of surface dirt. Stains and discolorations of every intensity and nature encountered.
   2. Dilute cleaning products with water as recommended by testing and in accordance with the manufacturer's printed instructions.
   3. Water used for cleaning shall be clean, potable and free of soluble and insoluble iron.
   4. The use of wire brushes or steel wool will not be permitted.
   5. Inspection of the building shall be carried on full time during cleaning operations.
   6. Scrubbing methods will be employed, using natural fiber bristle brushes for cleaning deeply embedded din from areas which prove hard to clean by other means.
   7. Should the contractor wish to modify any cleaning method specified, he shall submit his proposal in writing for consideration and review. DCAS will have the right to ask for test samples before final approval. Any such modifications or changes shall be at no additional cost to the City.
   8. Finished work shall show no signs of stains, scratches, streaks or runs of discoloration from use of cleaners. Leave all exposed surfaces neat and clean. The appearance of the stone after cleaning and after adequate drying time shall be uniformly clean.
   9. In locations where stubborn stains arid soil deposits exist, re-application of cleaners will be required until stone color is uniform.
   10. Selective stain removal may be necessary in some locations following cleaning. This shall be done with approved chemical cleaner or poultice with the approval of DCAS.
   11. Work shall not be considered complete until DCAS has so notified the Contractor in writing.

C. General Rinsing Methods
   1. Sources of water shall be obtained prior to installation of any equipment, and shall be provided at no additional cost to the City. The water shall be filtered with a 5 micron particulate filter placed in line with the water supply.
   2. Rinsing shall be performed with sponges. Light water misting may be employed if water collection methods are in place and have been previously approved by the DCAS.
   3. Water used for cleaning shall be filtered through a five (5) micron particulate filter placed in line with the water supply. The filter shall be replaced as needed during the work.
   4. Temporary water supply systems erected for the purpose of delivering water during the cleaning process shall be constructed of polyvinylchloride (PVC) tubing. All hoses,

finings, pumps and other equipment shall be made with non- ferrous alloy parts.

D. Execution: Cleaning polished marble:
   1. Soil shall be removed from marble in the following manner:
      a. Apply detergent solution in water to marble. Dwell time shall be in accordance with approved test procedures and manufacturers written instructions.
      b. Scrub surface using soft bristle, natural, fiber brushes during dwell time. Pay particular attention to crevices in carved and decorated surfaces.
      c. Rinse all traces of chemical and residue with water. Repeat procedure if necessary.
      d. Rinse wastewater shall not be allowed to remain on floor or adjacent surfaces and shall be removed by means of approved vacuum system to prevent ponding or accumulation of rinse waste water.

3.9 CLEANUP

A. Properly remove any and all debris (resulting from the work) from the building and leave the premises broomed and mopped clean at the end of each work shift.

B. Clean all glass surfaces soiled as a result of the work.

3.10 MARBLE POLISHING

A. Upon the completion of cleaning marble surfaces, per the direction of DCAS representative, slowly polish the marble to a high sheen with power machine equipment.

B. Per manufacturer’s direction, use “Stone Glo” with # 800 line screen or an approved equal.

3.11 PROTECTION

A. Comply with each manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent paint removers and chemical cleaning solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.
   1. Cover adjacent surfaces with materials that are proven to resist paint removers and chemical cleaners used unless products being used will not damage adjacent surfaces. Use protective materials that are waterproof and UV resistant. Apply masking agents according to manufacturer's written instructions. Do not apply liquid strippable masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
   2. Do not apply chemical solutions during winds of enough force to spread them to unprotected surfaces.
   3. Neutralize alkaline and acid wastes before disposal.
   4. Dispose of runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

B. Remove gutters and downspouts and associated hardware adjacent to immediate work area and store during masonry cleaning. Reinstall when masonry cleaning is complete.
   1. Provide temporary rain drainage during work to direct water away from building.

3.12 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage paint-remover manufacturer's and chemical-cleaner manufacturer's factory-authorized service representatives for consultation and Project-site inspection, to perform preconstruction product testing, and provide on-site assistance when requested by Architect. Have paint-remover manufacturer's and chemical-cleaner manufacturer's factory-authorized service representatives visit Project site not less than once, twice to observing progress and quality of the work.

3.13 MEASUREMENT AND PAYMENT

A. Unit prices – SEE BID SHEET

END OF SECTION 045200

SECTION 050170
MAINTENANCE OF
DECORATIVE METAL

PART 1 – GENERAL

1.1 SUMMARY

A. Work included: Provide ferrous metal restoration in accordance with the Contract Documents. The Work of this Section shall include but not be limited to the following:
   1. Repair/replace pivot pins on iron gates. Repair gates and operating hardware on gates and return to working order.
   2. Repair broken cast iron gate frames.
   3. Remove all paint and corrosion from iron gates, frames, and grilles, prime and re- paint.
   4. Furnish and install, new ironwork gate, frame, grilles, hardware, and paint finish, complete.
   5. Remove and re-set anchors or gate supports.

B. Related Work of Other Sections: The following related work is to be performed by other trades under the designated sections:
   1. "Stone Masonry" – Section 044300
   2. "Maintenance of Stone Assemblies" – Section 040140
   3. "Painting "– Section 099100
   4. "Paint Removal" – Section 099101

1.2 QUALITY ASSURANCE

A. The Contractor or subcontractor performing the Work of this Section, must during the last five (5) years prior to bid opening, as a prime contractor or subcontractor have successfully completed in a timely fashion at least two (2) projects similar in scope and type to the required work in this Contract (i.e. ferrous metal restoration work on buildings that are considered to be landmark, landmark quality or buildings of equivalent historical or architectural significance).

B. The Contractor shall maintain a steady work crew consisting of qualified craftsmen who are experienced with the materials and methods specified and familiar with the design requirements.

C. Trade Supervision: The Contractor shall confirm that all workmen under his direction fully understand the requirements of the job. All mechanics shall be directly supervised by a foreman, or other designated person, with the same or more experience set forth in Section 1.2A of this Section. The foreman shall be present at the job site daily for the duration of the Work of this Section. The same foreman for each trade shall remain on the job, unless performance is deemed unacceptable. At least one person who is able to communicate in English shall be on site at all times.

D. Field Supervised Construction: Contractor shall notify DCAS before beginning metal restoration and obtain DCAS's approval for the installation of restored metal, before proceeding with the work.

E. The Contractor shall replace all broken, lost and damaged metalwork resulting from repair, removal, transportation, cleaning or storing at no expense to the Owner.

F. In acceptance or rejection of this work, no account shall be taken for incompetence or lack of skill on the part of the workmen.

G. Materials and work shall conform to the latest edition of reference specifications listed below, specified herein and to all applicable code and requirements of local authorities having jurisdiction, whichever is more stringent.
   1. American Welding Society Code, AWS D1-1 "Structural Welding" (latest edition).
   2. "Manual of Steel Construction," American Institute of Steel Construction (AICS).
   3. SSPC SP-6, "Surface Preparation Specification No. 6, Commercial Blast Cleaning," or SSPC SP-11 "Surface Preparation Specification No. 11, Power Tool Cleaning to Bare Metal."
   4. SSPC PA-1, "Painting Application Specification," Steel Structures Painting Council – "Shop, Field and Maintenance Painting, Steel Structure Painting Manual", vol. 2.
   5. "Handbook on Bolt, Nut and Rivet Standards," Industrial Fasteners Institute (IFI).
   6. Relevant ASTM Standards for all materials.

H. Source of Materials: Obtain materials for metal restoration from a single source for each type of material required to ensure a match in quality, color, texture, and pattern.

I. Take field measurements prior to preparation of shop drawings and fabrication, where possible, to ensure proper fitting of the work. However, do not delay job progress; allow for adjustments and fitting where taking of field measurements before fabrication might delay the work.

J. Erect work square, plumb, straight, and true. Fit work accurately and anchor securely in place. All flat metal surfaces shall be installed perfectly level or pitched as specified in one plane.

K. Confirm specified dry mil thickness of applied primer with standard equipment recognized by the industry for determining the thickness of paint coatings.

L. Decorative Metal Cleaning Specialist Qualifications: A qualified decorative metal cleaning specialist. Cleaning specialist shall be experienced in using mechanical and chemical methods on the types of metal surfaces indicated.

1.3 SUBMITTALS

A. Qualification Data: Submit qualification data for firms and people specified in "Quality Assurance" Article that demonstrate their capabilities and experience as required in that article. List project names, addresses, names and telephone numbers of Architect and Owner, plus other specified information.

B. Documentation: Submit documentation as described in "Documentation" article, below. Number tags shall be noted on plan drawings. Ironwork may not be removed until approval of the documentation.

C. Program of Work: Submit a written program for each restoration phase of this Contract, include protection of surrounding materials on the building and site, and adjoining properties, during operations.
   1. Include detailed description of materials, methods, and equipment to be used for each phase of the restoration work of the Contract.
   2. Include written descriptions, drawings, and diagrams, outlining proposed methods and procedures for protection of personnel, the public, and the existing construction during the Work of this Section.
   3. If alternate methods and materials to those specified are proposed for any phase of the iron restoration work, provide written description. Provide evidence of successful use on comparable projects and demonstrate its effectiveness for use on this project.

D. Product Data and Literature: Submit manufacturers', fabricators' and finishers' technical data for each product, specifications, installation instructions for products used in metalwork, include recommendations for application and use of all finishing materials and methods. Include test reports and certificates substantiating the products compliance with the specified requirements.

E. Samples: Submit, for verification purposes, prior to mock-up erection, samples of the following:
   1. Samples of all attachments, anchors, inserts, fastenings, adhesives, preparations and products included in this section.
   2. Paint Samples: Primer, intermediate primer, and finish coat applied to iron samples measuring 4" x 4".
   3. Submit (2) sets of representative samples, 6" or longer, of each metal and finish required. Prepare samples of metal of same alloy and thickness to be used for the work. Where normal color and texture variations are to be expected, include (2) or more sets of each sample showing the limits of such variations.

F. Shop Drawings:
   1. Submit for fabrications and installation of all types of ornamental metalwork, showing locations, layouts, materials, thicknesses, finishes, dimensions, construction, relation to adjoining construction, erection details, profiles, jointing and all other details to fully illustrate the work of this Section. Provide setting diagrams and templates for anchorages, sleeves and bolts installed by others.
   2. Submit large scale drawings showing new anchorage system for gate.

G. Field Constructed Mockups: Before beginning iron restoration, prepare the following samples and obtain DCAS's acceptance of visual qualities before proceeding with the work. Mockups shall remain as a record at the site until the Work is completed and approved by DCAS.
   1. Execute complete sequence of restoration of one gate leaf, selected by DCAS; include paint removal, repainting, and new anchors.

H. Samples submitted which are approved by DCAS shall remain as a record at the site until the work is completed and approved by DCAS.

1.4 DELIVERY, STORAGE, AND HANDLING

A. General: Deliver, store, handle, and protect all materials from damage, moisture, dirt, and introduction of foreign matter. Store all iron materials on raised platforms and under ventilated, waterproof cover. Store packaged materials in manufacturer's unopened containers, marked with manufacturer's name and product brand name. Immediately reseal containers after partial use. Remove and replace damaged materials.

1.5 FIELD CONDITIONS

A. Weather Limitations: Proceed with decorative metal cleaning only when existing and forecasted weather conditions are within the environmental limits set by each manufacturer's written instructions and specified requirements.

1.6 PROTECTION

A. Take all necessary precautions to protect all persons, property and materials (whether subject to the work of this Section or not) from any harm or damage associated with the work of this Section.

B. Take all necessary precautions to prevent fire and spread of fire.

C. Take all necessary precautions to protect workers and the public from any hazards involved in the work of this Section.

PART 2 – PRODUCTS

2.1 MATERIALS

A. General: Provide materials which have been selected for their surface flatness, smoothness and freedom from surface blemishes where exposed to view in the finished unit. Exposed to view surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, or other imperfections on the finished units will not be acceptable.

B. Wrought Iron: Metal used in replacing wrought iron shall be steel complying with ASTM A36, latest edition.

C. Casting: All cast grilles or other new castings shall be cast malleable iron conforming to ASTM A47 Grade 32510.

D. Patching Material: Crack filler and patching material shall be Belzona "Supermetal" from Belzona Molecular, Inc., 100 Charles Lindbergh Blvd., Uniondale, NY 11553, (516) 594- 4994, Or an Approved Equal.

E. Welding Electrodes and Filler Metal: Type and alloy of filler metal and electrodes as recommended by producer of the metal to be welded, and as required for color match, strength and compatibility in the fabricated items. For welding existing cast iron, use Nickel 99 electrodes and rod.

F. Anchors for Ironwork onto masonry: Adhesive anchors consisting of stainless-steel threaded rods

set in moisture insensitive modified epoxy adhesive. Provide Hilti HIT HY-150 anchors manufactured by the Hilti Corp, Or an Approved Equal.

G. Fasteners and Anchoring Devices:
   1. Fasteners: Bolts, nuts, washers, screws, rivets and other connection devices to be stainless steel according to ASTM F 593. For components of mating fasteners (bolts, nuts and washers) use stainless steel according to ASTM F 594.
   2. Masonry Anchorage Devices: Expansion shields shall conform to Federal Specification FF-S-325.

H. Primer for Blast Cleaned Iron and Steel: "Series 66, Hi-Build Epoxoline," manufactured by Tnemec Company, Inc., Woburn, MA, Or an Approved Equal. Apply (2) coats. Provide minimum 5 mil dry film thickness.

I. Primer for Hand Tool Cleaned Iron and Steel: "Series 135, Chem Build," manufactured by Tnemec Company, Inc., Woburn, MA, Or an Approved Equal. Apply (2) coats. Provide minimum 5 mil dry film thickness.

J. Second and Finish Coats: "Series 73 Endura-Shield III, Hi-Build Acrylic Polyurethane Enamel," manufactured by Tnemec Company, Inc., Woburn, MA, Or an Approved Equal. Provide one intermediate coat and two finish coats, 4-9 mil dry film thickness.

K. Colors: Paint colors shall be selected by the Resident Engineer. Prime coats and undercoats shall each have a slight variation in color to distinguish them from the preceding coat. All finish paints shall be "ready-mixed" matching the approved color displays. Colors shall be pure, non-fading pigments, mildew-proof, sun-proof, finely ground in approved medium.

2.2 ACCEPTABLE MANUFACTURERS

A. Subject to the requirements of this section, provide products of one of the following manufacturers:
   1. Architectural Iron Company, 104 Ironwood Rd., Milford, PA 18337, (800) 442-4766
   2. Historical Arts and Castings, Inc., 5580 W. Bagley Rd., West Jordan, Utah 84088, (800) 225-1414.
   3. Robinson Iron Corp., Robinson Rd., Alexander City, Alabama 35011, (212) 491-2800
   4. Or an Approved Equal.

2.3 FABRICATION

A. Take field measurements prior to preparation of shop drawings and fabrication. Do not delay job progress; allow for trimming and fitting wherever taking field measurements before fabrication might delay work.
   1. Provide for additional rail extensions and adjust lengths to accommodate new designs.
   2. Additions and subtractions from the width (horizontal) of existing panels shall be made

symmetrically to both ends of the panel. For new work, deviations from the width of the panels shall be spaced symmetrically.

B. Components shall be designed and fabricated to allow for expansion and contraction for a minimum ambient temperature range of 120□ F., without causing buckling, excessive opening of joints or overstressing of welds and fasteners or anchors.

C. All removable members shall be carefully machined and fitted and shall be secured by screws or bolts of proper size and approved spacing.

D. Drill or cleanly punch holes; do not burn.

2.4 CASTINGS

A. Where possible, use original castings. If not possible, adhere to the outline, as noted.

B. Molds shall be made from the approved models, complete with core boxes, loose pieces, and all required operation equipment. The cores shall be carefully set and secured, so that cross-sections of all parts shall be of uniform thickness.

C. Castings shall be made in properly vented molds faced with the best, finest grained material to give optimum smoothness to the cast surface and shall be thoroughly cleaned before painting.

D. Castings: Provide castings to match existing original elements in material, dimension, configuration, and profile. Provide castings that are sound and free of warp, cracks, blow holes, or other defects that impair strength or appearance. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks. Machine with holes for fasteners and other elements to match existing units. Finish castings to match finish of existing elements.

E. Properly finish such portions of all castings necessary to assure that such shall fit in a neat and satisfactory manner.

F. Clean all castings prior to painting in accordance with the requirements of the Steel Structures Painting Council (SSPC) SP-6, Commercial Blast Cleaning.

2.5 SHOP FINISHING

A. Shop coat all ferrous metal surfaces using specified primer paint and two coats of the specified paint according to the Steel Structures Painting Manual Vol. 2, SSPC PA-1, “Paint Application Specification No. 1, Shop, Field and Maintenance Painting.”

1. Protect all copper alloy ornaments in place on railings during restoration of railings.

B. Paint shall be delivered in the original containers of the approved manufacturer.

C. Painting shall be done in dry weather or under cover, and steel or iron surfaces shall be free from moisture or frost. No materials shall be delivered until the shop coat has dried.

D. Remove loose rust, mill scale and existing paint by air abrasive cleaning as specified in Steel Structures Painting Manual Vol. 2, SSPC SP-6, “Commercial Blast Cleaning.”

E. Each primer coat applied shall produce a dry film thickness of 2.0 to 2.5 mils. Finish coats shall produce a minimum dry film thickness of 2.0 to 3.5 mils.

F. Surfaces concealed from view in the finished construction work, and which will not be accessible shall receive an additional shop coat of paint. Touch-up marred and abraded surfaces with the specified paint after erection in the field.

G. Repaint areas of shop coat damaged during handling or installation with paint similar to that applied in the shop.

H. Corrosion Protection: Coat concealed surfaces which will be in contact with concrete, masonry, or dissimilar metals and in exterior work with a heavy coat of bituminous paint. Do not extend coating onto exposed surfaces. Do not coat anchors set in lead.

2.6 CLEANING MATERIALS

A. Water: Potable.

B. Hot Water: Water heated to a temperature of 140 to 160 deg F (60 to 71 deg C)

C. Detergent Solution, Job Mixed: Solution prepared by mixing 2 cups (0.5 L) of tetrasodium pyrophosphate (TSPP), 1/2 cup (125 mL) of laundry detergent, and 20 quarts (20 L) of hot water for every 5 gal. (20 L) of solution required.

D. Nonacidic Liquid Chemical Cleaner: Manufacturer's standard mildly alkaline liquid cleaner, formulated for removing organic soiling from ordinary building materials, including polished stone, brick, copper, brass, bronze, aluminum, stainless steel, plastics, wood, and glass.

E. Abrasive Materials
   1. Abrasive Pads for Copper-Alloy Cleaning: Extra-fine bronze wool or plastic abrasive pads.
   2. Blasting Abrasive: Pulverized walnut shells and Powdered aluminum silicate.
   3. Abrasives for Ferrous Metal Cleaning: Aluminum oxide paper, emery paper, fine steel wool, steel scrapers, and steel-wire brushes of various sizes.

F. Rust Remover: Manufacturer's standard phosphoric acid-based gel formulation, also called "naval jelly," for removing corrosion from iron and steel.

2.7 PAINT REMOVERS

A. Alkaline-Paste Paint Remover: Manufacturer's standard alkaline paste or gel formulation for removing paint from metals and containing no methylene chloride.

B. Covered or Skin-Forming Alkaline Paint Remover: Manufacturer's standard covered or skin-

forming alkaline paste or gel formulation for removing paint from metal, and containing no methylene chloride.

C. Solvent-Type-Paste Paint Remover: Manufacturer's standard water-rinsable, solvent-type paste or gel formulation for removing paint from metals.

D. Low-Odor, Solvent-Type-Paste Paint Remover: Manufacturer's standard low-odor, water-rinseable solvent-type paste, gel, or foamed emulsion formulation for removing paint from metals; and containing no methanol or methylene chloride.

E. Covered, Solvent-Type-Paste Paint Remover: Manufacturer's standard, low-odor, covered, water-rinseable, solvent-type paste or gel formulation for removing paint from masonry; and containing no methanol or methylene chloride.

2.8 SEQUENCING AND SCHEDULING

A. Removal of existing iron fabrications shall proceed before the beginning of masonry restoration and cleaning and dismantling.

PART 3 – EXECUTION

3.1 COORDINATION

A. The Contractor shall provide a schedule for the removals, storage, reinstallation, and methods of protection prior to beginning any work.

B. Coordinate removal and reinstallation of iron gates with new wood doors and stone restoration.

C. Coordinate repair and painting of ferrous metal grilles and gates with masonry and railing work at entrance.

3.2 DOCUMENTATION

A. Remove the iron items to be restored. Identify each piece before removal with a metal tag identifying exact location. Numbers shall be keyed to drawings.

B. Before beginning the work of this Section, photographically document conditions of all materials to be removed and salvaged. Prints shall be minimum 5” x 7”, labeled, and keyed to drawings showing the locations of the items. Prints shall be placed in clear sleeves and kept in a carefully labeled binder. Binder shall be always accessible.

3.3 PROCEDURES: IRON GATES- Shop Restoration

A. Remove gates to a shop for restoration, where possible. Identify each gate leaf with a metal tag prior to removal from the building.

B. Remove all paint and corrosion from the ironwork by abrasive blast methods. All work to be

performed in accordance with the requirements of Section 099101. All exposed surfaces of iron to be cleaned to SSPC SP-6.

C. Weld all opened joints.

D. Fill all holes in gates with specified patching compound.

E. Fabricate and attach new hardware for mounting the gates to masonry, where necessary. Attach by welding. Repair and/ or replace all hardware to return gates to full operability.

F. Remove all dust, mill scale, and additional corrosion and rinse completed unit with a suitable solvent to remove all dirt and oils.

G. Prime paint with specified primer. Paint with finish paint. All work shall be performed in accordance with the requirements of Division 9 Section “Painting”

3.4 PROCEDURES: WELDING

A. Comply with AWS Code for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of the exposed side. Clean exposed welded joints of all welding flux, and dress on all exposed and contact surfaces.

3.5 PROCEDURES: IRONWORK NOT TO BE REMOVED FROM SITE

A. Remove all paint from ironwork in accordance with the procedures of Section 099101.

B. Remove all soil, and corrosion products using hand tools and hand-held power tools to bright metal (SSPC-SP11).
   1. Thoroughly protect adjacent masonry.

C. Weld all opened joints. Weld cracked pieces of cast iron. Grind welds smooth.

D. Fill all holes in gates with specified patching compound.

E. Repair and/ or replace all hardware to return gates to full operability.

F. Remove all dust, mill scale, and additional corrosion and rinse completed unit with a suitable solvent to remove all dirt and oils.

G. Prime paint with specified primer. Paint with finish paint. All work shall be performed in accordance with the requirements of Division 9 Section “Painting”

3.6 PROCEDURES: PAINTING

A. Refer to Division 9 Section “Painting”

B. All removed items shall be reinstalled as soon as possible after final paint application. Paint must be dry before reinstallation. Touch up surfaces after installation as required.

C. Protect all surfaces and materials not to be painted. Any paint on such surfaces or materials shall be removed to the complete satisfaction of the Architect, at no additional cost to the City.

3.7 INSTALLATION OF GATES

A. Provide anchorage devices and fasteners for securing gates to masonry.

B. Perform all cutting and drilling of masonry required for the installation of the gates. Set the work accurately in location, alignment and elevation, plumb, level and true, measured from established lines and levels.

C. Do not alter gates except for installation of new anchoring devices and hardware.

D. Restore protective coverings which have been damaged during shipment or installation of the work.

E. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at the same location.

3.8 MOLDMAKING PROCEDURE

A. Attach embossed numbered tag to each element to be reproduced and cross-reference its location on documentation drawings.

B. Allow Resident Engineer to inspect and document the condition of the element.

C. Prepare element for transfer to shop for restoration work.

D. Remove element to shop for restoration work.

E. Remove all paint from element.

F. Make mold from cleaned element.

3.9 NEW CASTINGS

A. Preparation:
   1. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting of work. Do not delay job progress; allow for adjustments and fitting where taking field measurements before fabrication might delay work.
   2. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of items having integral anchors which are to be embedded

in masonry construction. Coordinate delivery of such items to the project site.

3.10 INSTALLATION OF NEW IRONWORK FABRICATIONS

A. All ironwork shall be installed in strict accordance with plans and specifications in a workmanlike manner.

B. Install iron fabrications plumb, level and secure.

C. Install iron fabrications after the completion of masonry cleaning and restoration.

D. Do not cut or abrade finishes which cannot be completely restored in the field. Return items with such finishes to the shop for required alteration, followed by complete refinishing, or provide new units at Contractor's option.

E. Restore protective coverings which have been damaged during shipment or installation of the work. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at the same location.

F. Field Welding:
   1. Comply with AWS Code for the procedures of manual shielded metal-arc welding, the appearance and quality of welds made, and the methods used in correcting welding work.
   2. Any field welding required shall be concealed and not visible in the finished work.

3.11 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

B. Per Section 050170, the repair of ironwork gate and frame shall include, but not be limited to, the replacement of pivot pins, hinges and operating hardware, re-finishing and all necessary miscellaneous masonry work required for removal and reinstallation as well as including all other work as specified in the drawings, to bring the gate and frame to complete working order, is deemed included in the Unit Price.

C. Per Section 050170, the demolition and removal of existing ironwork shall be a part of the work, deemed included in the Unit Price.

END OF SECTION 050170

SECTION 051200
STRUCTURAL STEEL FRAMING

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Contract Documents apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Structural steel.
2. Prefabricated building columns.
3. Field-installed shear connectors.
4. Grout.

B. Related Requirements:
1. Section 053100 "Steel Decking" for field installation of shear connectors through deck.
2. Section 055000 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame, miscellaneous steel fabrications and other steel items not defined as structural steel.

1.3 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.

C. Heavy Sections: Rolled and built-up sections as follows:
1. Shapes included in ASTM A 6/A 6M with flanges thicker than 1-1/2 inches (38 mm).
2. Welded built-up members with plates thicker than 2 inches (50 mm).
3. Column base plates thicker than 2 inches (50 mm).

D. Protected Zone: Structural members or portions of structural members indicated as "Protected Zone" on Drawings. Connections of structural and nonstructural elements to protected zones are limited.

E. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings.

1.4 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint

and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals: Not Used.

C. Shop Drawings: Show fabrication of structural-steel components.
1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment Drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
5. Identify members and connections of the Seismic-Load-Resisting System.
6. Indicate locations and dimensions of protected zones.
7. Identify demand critical welds.

D. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code- Steel," for each welded joint whether prequalified or qualified by testing, including the following:
1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand critical welds.

E. Delegated-Design Submittal: For structural-steel connections indicated to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, fabricator, shop-painting applicators, testing agency.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural steel, including chemical and physical properties.

E. Product Test Reports: For the following:
   1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
   2. Direct-tension indicators.
   3. Tension-control, high-strength, bolt-nut-washer assemblies.
   4. Shear stud connectors.
   5. Shop primers.
   6. Nonshrink grout.

F. Survey of existing conditions.

G. Source quality-control reports.

H. Field quality-control and special inspection reports.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in the fabrication of steel products to be used in this Contract shall have a minimum of five years' experience. A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE. The entity performing the work of this section must have a minimum of three years' experience and have done at least three projects with similar quantity of material.

C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint or to SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code- Steel."
   1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

E. Comply with applicable provisions of the following specifications and documents:
   1. AISC 303.
   2. AISC 341 and AISC 341s1.
   3. AISC 360.
   4. RCSC's "Specification for Structural Joints Using ASTM A 325."

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
   1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
   2. Clean and relubricate bolts and nuts that become dry or rusty before use.
   3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

PART 2- PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of connections required by the Contract Documents to be selected,

B. or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.
   1. Select and complete connections as indicated on Contract Documents.
   2. Use Strength or Stress Design factors as indicated on Contract Documents.

C. Moment Connections: Type PR, partially or Type FR, fully restrained as indicated on Contract Documents.

2.2 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/A 992M, Grade 50 (345).

B. Channels, Angles, M, S-Shapes: ASTM A 36/A 36M.

C. Plate and Bar: ASTM A 36/A 36M.

D. Corrosion-Resisting Structural-Steel Shapes, Plates, and Bars: ASTM A 588/A 588M, Grade 50 (345).

E. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade B, structural tubing.

F. Corrosion-Resisting, Cold-Formed Hollow Structural Sections: ASTM A 847/A 847M, structural tubing.

G. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.
   1. Weight Class: As indicated on Contract Documents.
   2. Finish: Black except when indicated to be galvanized.

H. Steel Castings: ASTM A 216/A 216M, Grade WCB with supplementary requirement S11.

I. Steel Forgings: ASTM A 668/A 668M.

J. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, (ASTM A 563M, Class 8S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers; all with plain finish.
   1. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with plain finish.

B. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
   1. Finish: Plain.

C. Unheaded Anchor Rods: ASTM F 1554, Grade 36, unless different grade is specified elsewhere.
   1. Configuration: Straight or Hooked.
   2. Nuts: ASTM A 563 (ASTM A 563M) heavy-hex carbon steel.
   3. Plate Washers: ASTM A 36/A 36M carbon steel.
   4. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
   5. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

D. Headed Anchor Rods: ASTM F 1554, Grade 36, unless different grade is specified elsewhere, straight.
   1. Nuts: ASTM A 563 (ASTM A 563M) heavy-hex carbon steel.
   2. Plate Washers: ASTM A 36/A 36M carbon steel.
   3. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
   4. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

E. Threaded Rods: ASTM A 36/A 36M, or ASTM A 193/A 193M, Grade B7.
   1. Nuts: ASTM A 563 (ASTM A 563M) heavy hex carbon steel.
   2. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
   3. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

F. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.

G. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.

H. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

I. Structural Slide Bearings: Low-friction assemblies, of configuration indicated, that provide vertical transfer of loads and allow horizontal movement perpendicular to plane of expansion joint while resisting movement within plane of expansion joint.

2.4 PRIMER

A. Primer: Comply with Division 9 Section “Painting”

B. Primer: SSPC-Paint 25, Type I, zinc oxide, alkyd, linseed oil primer.

C. Primer: SSPC-Paint 25 BCS, Type I, zinc oxide, alkyd, linseed oil primer.

D. Primer: SSPC-Paint 23, latex primer.

E. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

F. Galvanizing Repair Paint: ASTM A 780/A 780M.

2.5 GROUT

A. Metallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
   1. Camber structural-steel members where indicated.
   2. Fabricate beams with rolling camber up.
   3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
   4. Mark and match-mark materials for field assembly.
   5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
   1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, flame cut, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning."

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

G. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural-steel frame. Straighten as required to provide uniform, square, and true members in completed wall framing. Build up welded framing, weld exposed joints continuously, and grind smooth.

H. Welded Door Frames: Build up welded door frames attached to structural-steel frame. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches (250 mm) o.c. unless otherwise indicated.

I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
   1. Cut, drill, flame cut, or punch holes perpendicular to steel surfaces.
   2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
   3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.7 PREFABRICATED BUILDING COLUMNS

A. Prefabricated building columns consisting of load-bearing structural-steel members protected by concrete fireproofing encased in an outer non-load-bearing steel shell.
   1. Manufacturers and products shall be as indicated on Contract Documents or an Approved Equal.

B. Fire-Resistance Ratings: Provide prefabricated building column listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for ratings indicated, based on testing according to ASTM E 119.
   1. Fire-Resistance Rating: 2 hours unless otherwise indicated.

2.8 SHOP PRIMING

A. Shop prime steel surfaces except the following:
   1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
   2. Surfaces to be field welded.
   3. Surfaces of high-strength bolted, slip-critical connections.
   4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
   5. Galvanized surfaces.
   6. Surfaces enclosed in interior construction.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
   1. SSPC-SP 2, "Hand Tool Cleaning."

2. SSPC-SP 3, "Power Tool Cleaning."
3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
5. SSPC-SP 14/NACE No. 8, "Industrial Blast Cleaning."
6. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
7. SSPC-SP 10/NACE No. 2, "Near-White Blast Cleaning."
8. SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning."
9. SSPC-SP 8, "Pickling."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

D. Painting: Prepare steel and apply a one-coat, no asphaltic primer complying with SSPC- PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils (0.038 mm).

2.9 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize lintels, shelf angles and welded door frames attached to structural-steel frame and located in exterior walls.

2.10 SOURCE QUALITY CONTROL

A. Testing Agency: DCAS will engage a qualified testing agency to perform shop tests and inspections.
1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

D. In addition to visual inspection, test and inspect shop-welded shear connectors according to

requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

E. Prepare test and inspection reports.

PART 3- EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedment for compliance with requirements.
   1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedment showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
   1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Baseplates, Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
   1. Set plates for structural members on wedges, shims, or setting nuts as required.
   2. Weld plate washers to top of baseplate.
   3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
   4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for

Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of structure.
   2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection unless to correct fabrication errors and to be done only upon approval of the Engineer of Record based on the method proposed. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

B. Joint Type: Slip critical.

C. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

D. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

E. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.

F. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.5 PREFABRICATED BUILDING COLUMNS

A. Install prefabricated building columns to comply with AISC 360, manufacturer's written recommendations, and requirements of testing and inspecting agency that apply to the fire-resistance rating indicated.

3.6 FIELD QUALITY CONTROL

A. Special Inspections: DCAS will engage a qualified special inspector to perform the following special inspections:

B. Verify structural-steel materials and inspect steel frame joint details.

C. Verify weld materials and inspect welds.

D. Verify connection materials and inspect high strength bolted connections.

E. Testing Agency: DCAS will engage a qualified testing agency to perform tests and inspections.

F. Bolted Connections: Inspect and test bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

G. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
   1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
   2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

3.7 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780/A 780M.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 9 Section “Painting”

D. Touchup Priming: Cleaning and touchup priming are specified in Division 9 Section “Painting”

END OF SECTION 051200

SECTION 053100
STEEL DECKING

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Contract Documents apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Roof deck.
2. Cellular roof deck.
3. Acoustical roof deck.
4. Acoustical cellular roof deck.
5. Composite floor deck.
6. Electrified cellular floor deck.
7. Noncomposite form deck.
8. Noncomposite vented form deck.

B. Related Requirements:
1. Section 035216 "Lightweight Insulating Concrete" for lightweight insulating concrete fill over steel deck.
2. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.
3. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Sustainable Design Submittals: Not Used.

C. Shop Drawings:
1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

1. Power-actuated mechanical fasteners.
2. Acoustical roof deck.

D. Evaluation Reports: For steel deck, from ICC-ES.

E. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code- Sheet Steel."

C. Electrical Raceway Units: Provide UL-labeled cellular floor-deck units complying with UL 209 and listed in UL's "Electrical Construction Equipment Directory" for use with standard header ducts and outlets for electrical distribution systems.

D. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2- PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ROOF DECK

A. Approved Manufacturer: A manufacturer offering steel roof deck products to be incorporated into the work must be a member of the Steel Deck Institute.

B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
   1. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
      a. Color: Manufacturer's standard shop primer paint.
   2. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating.
   3. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
      a. Color: Manufacturer's standard shop primer paint.
   4. Aluminum-Zinc-Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Structural Steel (SS), Grade 33 (230) minimum, AZ50 (AZ150) aluminum-zinc-alloy coating.
   5. Deck Profile: As indicated on Contract Documents.
   6. Cellular Deck Profile: As indicated on Contract Documents, with bottom plate.
   7. Profile Depth: As indicated on Contract Documents.
   8. Design Uncoated-Steel Thickness: As indicated on Contract Documents.
   9. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated on Contract Documents.
   10. Span Condition: As indicated on Contract Documents.
   11. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.3 ACOUSTICAL ROOF DECK

A. Approved Manufacturer: A manufacturer offering steel roof deck products to be incorporated into the work must be a member of the Steel Deck Institute.

B. Acoustical Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
   1. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 (230) minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
      a. Color: Manufacturer's standard shop primer paint.
   2. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating.
   3. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
      a. Color: Manufacturer's standard shop primer paint.
   4. Aluminum-Zinc-Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Structural Steel (SS), Grade 33 (230) minimum, AZ50 (AZ150) aluminum-zinc-alloy coating.
   5. Deck Profile: As indicated on Contract Documents.
   6. Cellular Deck Profile: As indicated on Contract Documents, with bottom plate.

7. Profile Depth: As indicated on Contract Documents.
8. Design Uncoated-Steel Thickness: As indicated on Contract Documents.
9. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated on Contract Documents.
10. Span Condition: As indicated on Contract Documents.
11. Side Laps: Overlapped or interlocking seam at Contractor's option.
12. Acoustical Perforations: Cellular deck units with manufacturer's standard perforated flat-bottom plate welded to ribbed deck.
13. Sound-Absorbing Insulation: Manufacturer's standard premolded roll or strip of glass or mineral fiber. Actual physical properties and thicknesses of insulation per manufacturer's standards.
    a. Factory install sound-absorbing insulation into cells of cellular deck.
    b. Installation of sound-absorbing insulation is specified in Division 7.
14. Acoustical Performance: NRC 0.65, unless specified elsewhere, tested according to ASTM C 423.

2.4 COMPOSITE FLOOR DECK

A. Approved Manufacturer: A manufacturer offering steel roof deck products to be incorporated into the work must be a member of the Steel Deck Institute.

B. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
1. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 (230) minimum, with top surface phosphatized and unpainted and underside surface shop primed with manufacturers' standard baked-on, rust-inhibitive primer.
2. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating.
3. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating; with unpainted top surface and cleaned and pretreated bottom surface primed with manufacturer's standard baked-on, rust-inhibitive primer.
4. Profile Depth: As indicated on Contract Documents.
5. Design Uncoated-Steel Thickness: As indicated on Contract Documents.
6. Span Condition: As indicated on Contract Documents.

2.5 NONCOMPOSITE FORM DECK

A. Approved Manufacturer: A manufacturer offering steel roof deck products to be incorporated into the work must be a member of the Steel Deck Institute.

B. Noncomposite Form Deck: Fabricate ribbed-steel sheet noncomposite form-deck panels to comply with "SDI Specifications and Commentary for Noncomposite Steel Form Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:

1. Uncoated Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 (230) minimum.
2. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 (230) minimum, with top and underside surface shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
   a. Color: Manufacturer's standard shop primer paint.
3. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating.
4. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
   a. Color: Manufacturer's standard shop primer paint.
5. Profile Depth: As Indicated on Contract Documents.
6. Design Uncoated-Steel Thickness: As indicated on Contract Documents.
7. Span Condition: As indicated on Contract Documents.
8. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.6 NONCOMPOSITE VENTED FORM DECK

A. Approved Manufacturer: A manufacturer offering steel roof deck products to be incorporated into the work must be a member of the Steel Deck Institute.

B. Noncomposite Vented Form Deck: Fabricate ribbed- and vented-steel sheet noncomposite form-deck panels to comply with "SDI Specifications and Commentary for Noncomposite Steel Form Deck," in SDI Publication No. 31, and with the following:
   1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating.
   2. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G30 (Z90) zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
      a. Color: Manufacturer's standard shop primer paint.
   3. Profile Depth: As indicated on Contract Documents.
   4. Design Uncoated-Steel Thickness: As indicated on Contract Documents.
   5. Span Condition: As indicated on Contract Documents.
   6. Side Laps: Overlapped or interlocking seam at Contractor's option.
   7. Vent Slot Area: Manufacturer's standard vent slots providing 1-1/2 percent open area.

2.7 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel

screws, No. 10 (4.8-mm) minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile indicated.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch (1.52 mm) thick, with factory-punched hole of 3/8-inch (9.5-mm) minimum diameter.

J. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck. For drains, cut holes in the field.

K. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck, with 3-inch- (76-mm-) wide flanges and level recessed pans of 1-1/2-inch (38-mm) minimum depth. For drains, cut holes in the field.

L. Galvanizing Repair Paint: ASTM A 780/A 780M and manufacturer’s written instructions.

M. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3- EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions 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.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
   1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches (38 mm) long, and as follows:
   1. Weld Diameter: 5/8-inch (16 mm) nominal and 3/4 inch (19 mm) for deck thickness equal to or greater than 12 gauge.
   2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds 12 inches (305 mm) apart on average, but not more than a maximum of 18 inches (457 mm) and 6 inches (150 mm) apart in roof corners and perimeter, unless indicated differently elsewhere.
   3. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 36 inches (914 mm), and as follows:
   1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
   2. Mechanically clinch or button punch.
   3. Fasten with a minimum of 5/8 inch diameter arc puddle welds, or minimum 1-1/2-inch-(38-mm-) long fillet welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
   1. End Joints: Lapped 2 inches (51 mm) minimum or butted at Contractor's option.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld or mechanically fasten flanges to top of deck. Space welds or mechanical fasteners not more than 12 inches (305 mm) apart with at least one weld or fastener at each corner.
   1. Install reinforcing channels or zees in ribs to span between supports and weld or mechanically fasten.

E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.
   1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

G. Sound-Absorbing Insulation: Installation into topside ribs of deck as specified in Division 7.

3.4 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
   1. Weld Diameter: 5/8 inch (16 mm) nominal and 3/4 inch (19 mm) for deck thickness equal to or greater than 12 gauge.
   2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds 12 inches (305 mm) apart on average, but not more than a maximum of 18 inches (457 mm) and 6 inches (150 mm) apart in roof corners and perimeter, unless indicated differently elsewhere.
   3. Weld Spacing: Space and locate welds as indicated.
   4. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 36 inches (914 mm), and as follows:
   1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
   2. Mechanically clinch or button punch.
   3. Fasten with a minimum of 5/8 inch diameter arc puddle welds, or minimum 1-1/2-inch-(38-mm-) long fillet welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
   1. End Joints: Butted.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

F. Electrified Cellular Floor Deck: Install cellular floor system with deck assembled from units indicated.

G. Install piercing hanger tabs at 14 inches (355 mm) apart in both directions, within 9 inches (228 mm) of walls at ends, and not more than 12 inches (305 mm) from walls at sides unless otherwise indicated.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: DCAS will engage a qualified testing agency to perform tests and inspections.
B. Field welds will be subject to inspection.

C. Prepare test and inspection reports.

3.6 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation and apply repair paint.
   1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
   2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 099100 "Painting".

C. Repair Painting: Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 099100 "Painting”.

END OF SECTION 053100

SECTION 055000
METAL FABRICATIONS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the miscellaneous metal work as indicated on the drawings and/ or specified herein, including, but not limited to, the following:
   1. Rough hardware.
   2. Loose steel lintels.
   3. Miscellaneous framing and supports for the following:
      a. Suspended toilet partitions.
      b. Applications where framing and supports are not specified in other sections.
   4. Steel stair nosings.
   5. Vertical steel ladders.
   6. Steel pipe handrails and railings not part of steel pan stair assemblies.
   7. Light steel framing and supports, not included as part of work of other trades.
   8. Steel gratings and frames.
   9. Miscellaneous steel trim, corner guards, angle guards and channels.
   10. Radiator Covers
   11. Steel framing, bracing, supports, anchors, bolts, shims, fastenings, and all other supplementary parts indicated on drawings or as required to complete each item of work of this Section.
   12. Prime painting, touch-up painting, galvanizing and separation of dissimilar metals for work of this Section.
   13. Cutting, fitting, drilling, and tapping work of this Section to accommodate work of other Sections and of concrete, masonry or other materials as required for attaching and installing work of this Section.

1.3 RELATED SECTIONS

A. Division 4 Section “Unit Masonry” for steel lintels within masonry walls.

B. Division 5 Section “Pipe and Tube Railings”

C. Division 9 Section “Painting”

D. Division 10 Section “Toilet Compartments” for structural support system for ceiling hung compartments.

1.4 REFERENCES

A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
   1. American Society for Testing and Materials (ASTM)
      a. ASTM E894 "Standard Test Method for Anchorage of Permanent Metal Railing Systems and Rails for Buildings "
      b. ASTM E935 "Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings".
      c. ASTM E985 "Standard Specification for Permanent Metal Railing Systems and Rails for Buildings".
      d. ASTM E1481 "Standard Terminology of Railing Systems and Rails for Buildings"
   2. American Welding Society
      a. AWS D1.1 "Structural Welding Code".
      b. AWS D1.3 "Structural Welding Code -Sheet Steel"
      c. D1.2 "Structural Welding Code- Aluminum"
   3. National Association of Architectural Metal Manufacturers
      a. ANSI/NAAMM MBG 532 “Heavy Duty Metal Bar Grating Manual."
      b. NAAMM "Pipe Railing Manual".
      c. NAAMM "Metal Stairs Manual".
   4. The Society for Protective Coatings (SSPC): "Steel Structures Painting Manual, Volume 2, Systems and Specifications"
   5. Industrial Fasteners Institute (IFC).
      a. "Fastener Standards Book".

1.5 SYSTEM DESCRIPTION

A. Performance Requirements
   1. Catwalks and Adjacent Framing: Provide galvanized steel catwalks designed to support a live load of 100 lbf/ft.2 and a concentrated load of 300 lbf on an area of 4 in.2 , whichever produces the greater stress. Limit deflection to L/360 or 1/4 in., whichever is less.
   2. Steel Ladders: Provide galvanized steel ladders as shown, designed, and constructed to support a live load of 250 lbs./ft² per rung.
      a. Provide galvanized steel landing platforms designed to support a live load of 100 lbf/ft.2 and a concentrated load of 300 lbf .
      b. Industrial Type Ladders: Provide Industrial type ladders as shown, designed and constructed to support a live load of 100 lbf/ft.2 and a concentrated load of 300 lbf.
   3. Open Riser Stairs: Provide open riser steel stairs as shown, designed and constructed to support a live load of 100 lbf/ft.2 and a concentrated load of 300 lbf .
      a. Provide galvanized steel landing platforms designed to support a live load of 100 lbf/ft.2 and a concentrated load of 300 lbf .
   4. Railings, Guardrails and Supports
      a. Design and construct to withstand a 200 lbf load applied at any point, downward or horizontally or the simultaneous application of a lateral force of 40 plf and a vertical force of 50 plf , both applied at the top of the railing; the more stringent requirement governing.
   5. Gratings:

a. Unless otherwise shown, design gratings for a live load of 100 lbf/ft.2 and a concentrated load of 300 lbf on an area of 4 in.2 , whichever produces the greater stress. Limit deflection to L/360 or 1/4 in. , whichever is less.
b. Unless otherwise shown, design gratings capable of withstanding a uniform load of 600 lbf/ft.2. Limit deflection to L/360 or 1/4 in. , whichever is less.

6. Temperature Change Provisions: Design, fabricate and install exterior components to provide for expansion and contraction over an ambient temperature range of 120 deg. F. and a surface temperature range of 180 deg. F. without buckling, undue stress on members or anchors, and other detrimental effects. Fabricate joints that will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.
7. Design Modifications: Make design modifications of work shown only as may be necessary to meet performance requirements and coordinate the work. Variations in details and materials which do not adversely affect appearance, durability or strength shall be submitted to the Consultant for review. Maintain the general design concept without altering profiles and alignments shown.

1.6 QUALITY ASSURANCE

A. Basis of Design: When manufacturers 'materials, products or processes are specified for an item of Work, any one thereof is acceptable for the Subcontractor to choose. An alternative material, product or process will be considered if the Subcontractor submits a written substitution request together with such information as may be necessary to assist the Consultant in determining whether the proposed substitution is acceptable, the burden of proof rests solely upon the Subcontractor.

B. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.

C. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.

D. Reference Standards: The work is subject to requirements of applicable portions of the following standards:
1. "Manual of Steel Construction," American Institute of Steel Construction.
2. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code—Steel," AWS D1.2 "Structural Welding Code—Aluminum," and AWS D1.3 "Structural Welding Code—Sheet Steel."
3. SSPC SP-3 "Surface Preparation Specification No. 3, Power Tool Cleaning," Steel Structures Painting Council.
4. SSPC PA-1 "Painting Application Specification," Steel Structures Painting Council.
5. "Handbook on Bolt, Nut and Rivet Standards," Industrial Fasteners Institute

E. Steel Materials: For steel to be hot dip-galvanized, provide steel chemically suitable for metal coatings complying with the following requirements: carbon below 0.25 percent, silicon below 0.24 percent, phosphorous below 0.05 percent, and manganese below 1.35 percent. Notify galvanizer if steel does not comply with these requirements to determine suitability for processing.

F. Qualified Installer: Engage the services of a galvanizer who has demonstrated a minimum of five (5) years' experience in the successful performance of the processes outlined in this specification in the facility where the work is to be done and who will apply the galvanizing and coatings within the same facility as outlined herein. The Architect has the right to inspect and approve or reject the galvanizer/galvanizing facility.

G. Sole Source Responsibility: Obtain each type of metal fabrication from one source of a single manufacturer and with sufficient production capacity to produce required units without causing delay to the Work. Obtain accessory products used in conjunction with metal fabrications from the metal fabrications manufacturer or from sources acceptable to the metal fabrications manufacturer. The manufacturer shall furnish evidence that the specified materials have been manufactured by the same source and successfully utilized on a yearly basis for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.

H. Gratings Manufacturer: A manufacturer specializing in the fabrication of the type of units required who has tested the units for load-bearing strength and deflection and has currently published load tables based on recognized test procedures.

I. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from authorities having jurisdiction.
   1. Contractor shall engineer all required ladders and supports to comply with requirements of New York City Building Code.

J. The galvanizer/galvanizing facility must have an ongoing Quality Control/Quality Assurance program which has been in effect for a minimum of five years and shall provide the Architect with process and final inspection documentation. The galvanizer/galvanizing facility must have an on-premises testing facility capable of measuring the chemical and metallurgical composition of the galvanizing bath and pickling tanks.

K. Inspection and testing of hot-dip galvanized coating shall be done under the guidelines provided in the American Hot-Dip Galvanizers Association (AGA) publication "Inspection of Products Hot-Dip Galvanized After Fabrication."

L. Pre-Installation Meetings: Prior to the start of the Work, meet at the Project site to review methods and sequence of metal fabrication installation, special details and conditions, standard of workmanship, testing and quality control requirements, job organization and other pertinent topics related to the Work.

1.7 PERFORMANCE STANDARDS

A. Railings shall be constructed to conform to the following performance standards, unless greater required by Code.
   1. For projects in New York City, railings shall be designed to resist loads as specified in Article 3, Section 1607.7 of the New York City Building Code.

1.8 SUBMITTALS

A. Manufacturer's Literature: Submit manufacturer's specifications, load tables, dimension diagrams, anchor details and installation instructions for products to be used in the fabrication of miscellaneous metal work, including paint products. Submit for Consultant's action. Furnish manufacturer's literature describing the general properties of each product to be used in the Work. Include, manufacturer's technical data documenting the primary function, quality and performance of each system and containing specification for each material, load tables, dimension diagrams and installation instructions, or other such information as required by the drawings and specifications.

B. Shop Drawings: Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Include plans and elevations at not less than 1" to 1'-0" scale and include details of sections and connections at not less than 3" to 1'-0" scale. Show anchorage and accessory items.
   1. Provide setting drawings and templates for location of metal fabrications items that are to be embedded in or anchored to concrete or masonry and for anchors and bolts specified for installation under other Sections.

C. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

D. Submit calculations of all metal fabrication items engineered by the Contractor. Calculations shall be signed and sealed by a New York State licensed professional engineer or architect.
   1. Before any ladders and railings are fabricated, submit engineering data drawings to the Architect for review indicating how performance standards specified here shall be met. The Contractor is responsible for the structural design and supports for these systems and must show his proposed systems on these drawings.
   2. These drawings must show all load conditions and design calculations relative to connections, fastening devices and anchorage, as well as size and gauge of members.

   3. Calculations and drawings must be prepared by a Structural Engineer licensed in the State of New York and shall be signed and sealed by this Engineer.

E. Welding shall be indicated on shop drawings using AWS symbols and showing length, size and spacing (if not continuous). Auxiliary views shall be shown to clarify all welding. Notes such as 1/4" weld, weld and tack weld are not acceptable.

F. Certification: For items to be hot dip galvanized, identify each item galvanized and to show compliance of application. The Certificate shall be signed by the galvanizer and shall contain a detailed description of the material processed and the ASTM standard used for the coating and, the weight of the coating. In addition, and as attachment to Certification, submit reports of testing and inspections indicating compliance with the provisions of this Section.

1.9 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.10 WARRANTIES

A. Warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties and guaranties made by the Subcontractor under requirements of the Contract Documents.
   1. Special Warranty, Powder Coatings: Provide a written warranty, from the fabricator and the manufacturer (formulator) of powder coating system and the finisher, for a period of fifteen (15) years, warranting against the loss of film integrity, chalking, fading, non-uniformity, corrosion and the overall performance of color of the powder coatings. Upon notification of such defects, within the warranty period, make the necessary replacements at the convenience of the Owner.

PART 2 PRODUCTS

2.1 SOURCE QUALITY CONTROL

A. Subcontractor's Quality Control Responsibilities: Subcontractor is solely responsible for quality control of the Work.

B. Subcontractor's Inspection and Testing Agency: Subcontractor shall employ, at its own expense, an independent full time inspection agency to perform testing and inspection services for metal fabrication work as follows. Non-conforming Work shall be retested and paid for by Subcontractor.

C. Shop Inspection of Connections: Perform 100% visual inspection at bolted and welded connections in the Work. Examine the size, quality and placement of each connection to verify installation in accordance with Contract Documents and actioned shop drawings.

2.2 METAL SURFACES, GENERAL:

A. For metal fabrications work which will be exposed to view in the finished work, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Remove blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and applying surface finishes.

2.3 FERROUS METALS

A. Steel Plates, Shapes and Bars: ASTM A 36.

B. Steel Bar Grating: ASTM A 1011/A or ASTM A 36.

C. Steel Tubing: Cold formed, ASTM A 500; or hot rolled, ASTM A 501.

D. Structural Steel Sheet: Hot rolled, ASTM A 570; or cold rolled, ASTM A 611, Class 1; of grade required for design loading.

E. Steel Shapes

1. W – Fy = 50 ksi
2. MC – Fy = 36ksi
3. WT – Fy = 50 ksi
4. L – Fy = 35 ksi
5. HHS – Fy = 42 ksi

F. Galvanized Structural Steel Sheet: ASTM A 924, of grade required for design loading. Coating designation G90.

G. Steel Pipe: ASTM A 53, type and grade as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (Schedule 40), unless otherwise indicated.

H. Gray Iron Castings: ASTM A 48, Class 30, unless another class is indicated or required by structural loads.

I. Malleable Iron Castings: ASTM A 47, grade as selected by fabricator.

J. Brackets, Flanges and Anchors: Cast or formed metal of the same type of material and finish as supported items, unless otherwise indicated.

K. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
   1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 malleable iron or ASTM A 27 cast steel.
   2. Provide bolts, washers, and shims as required, hot dip galvanized per ASTM A 153.

2.4 WELDING RODS AND BARE ELECTRODES:

A. Select according to AWS specifications for the metal alloy to be welded.

2.5 NON-METALLIC SHRINKAGE RESISTANT GROUT:

A. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, non-corrosive, nongaseous grout containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CE-CRD-C621 and ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
   1. Grade B or Grade C, free of gas-producing or gas-releasing agents, oxidizing catalysts, inorganic accelerators, and chlorides. Grout shall be bleed-free and attain 7,500 psi compressive strength in 28 days at a fluid consistency of 20 to 30 seconds.

B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
   a. Euco-S Grout; Euclid Chemical Co.
   b. “Five Star Grout" (U.S. Grout Corp.).
   c. "Masterflow 928 and 713 (.Chemrex Inc.).

d. "Crystex" (L&M Construction Chemicals, Inc.).
e. Sealtight 588 Grout; W. R. Meadows, Inc.
f. Sonogrout 14; Sonneborn Building Products—ChemRex, Inc.
g. "Sure Grip Grout" (Dayton Superior).
h. Or an Approved Equal.

2.6 FASTENERS AND ANCHORAGE DEVICES:

A. Provide fasteners complying with the requirements of Industrial Fasteners Institute standards. Type, grade, class and style best suited for the respective purpose. Use countersunk flat-head Phillips type machine screws for exposed fasteners, except where Allen head screws are required. Use galvanized steel or stainless-steel fasteners for exterior construction and for fastening components fabricated of galvanized steel.
   1. General: Provide plated fasteners complying with A5TM B 633, Class Fe/Zn 25 for electrodeposited zinc coating, where built into exterior walls. Select fasteners for the type, grade, and class required.
   2. Bolts and Nuts: Regular hexagon head type, ASTM A 325, Grade A. with hex nuts, ASTM A 563, and where indicated, flat washers.
   3. Anchor Bolts: ASTM F 1554, Grade 36.
   4. Lag Bolts: ASME B18.2.1.
   5. Machine Screws: ASME B18.6.3.
   6. Wood Screws: Flat head, carbon steel, ANSI B 18.6.1.
   7. Plain Washers: Round, carbon steel, ASME B18.22.1.
   8. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.
   9. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.
   10. Lock Washers: Helical spring type carbon steel, ASME B18.21.1.
   11. Provide Type 304 or 316 stainless steel fasteners for exterior use and zinc plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls and fastening components fabricated of galvanized steel.
   12. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where required, flat washers; ASTM F593 for bolts and ASTM F594 for nuts.
   13. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E488, conducted by a qualified independent testing agency.
      a. Material for Indoor Conditions: Carbon steel components zinc plated to comply with ASTM B633, Class Fe/Zn 5.
      b. Material for Exterior Conditions: Alloy Group 1 or 2 stainless steel bolts complying with ASTM F593 and nuts complying with ASTM F594.

2.7 FABRICATION

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
C. Shear and punch metals cleanly and accurately. Remove burrs.

D. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Remove sharp or rough areas on exposed traffic surfaces.

F. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.

   4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous. Exposed threaded portion of bolts and screws shall be cut off flush with adjacent metal.

H. Provide for anchorage of type indicated, coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

I. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

J. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items and as required for the installation and attachment of other work to metal fabrications work. Shear and punch metals cleanly and accurately. Remove burrs. Remove sharp or rough areas on exposed traffic surfaces.

K. Supplementary Parts: Include supplementary parts necessary to complete metal fabrications work though not definitely shown or specified. Such parts include, but are not limited to, interface components necessary for the installation or anchorage to Work.

L. Verification of Measurements and Dimensions and Coordination and Schedule of Work: Verify measurements and dimensions at the job site and cooperate in the coordination and scheduling of the work of this Section with the work of related trades (with particular attention given to the installation of items embedded in concrete and masonry).

M. Formation of Metal Work: Form metal works built in with concrete or masonry for anchorage, or

provide suitable anchors, expansion shields, or other anchoring devices shown or required to provide support for intended use. Furnish metal work in ample time for setting and securing in place.

N. Procedures for Joints and Welds: Make joints as strong and rigid as adjoining sections. Make welds continuous along entire line of contact, except where spot welding is indicated. Grind exposed welds flush and smooth to match and blend with adjoining surfaces. Welded connections may be used where bolted connections are shown. Fabricate joints exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.
   1. Make up threaded connections tight so that threads are entirely concealed. Shoulder and head, dowel and pin abutting bars. Provide bolt and screw heads flat and countersunk in exposed work. Carefully machine, fit and secure removable members by means of Allen-head set screws of proper size and spacing.

O. Galvanizing
   1. ASTM A153 Classes A and B, for galvanizing iron and steel hardware.
   2. ASTM A123 for galvanizing rolled, pressed, and forged steel shapes, plates, bars, strip 1/8 in. thick and heavier and for assembled steel products.
   3. Items to be Galvanized: Galvanize ferrous metal utilized on the exterior and items embedded in concrete whether interior or exterior, unless otherwise specified. Galvanize other items where specified or shown.

P. Preassembly of Items: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Following trial fit, disassemble units only as necessary for shipping and handling. Clearly mark units for reassembly. Provide alignment and splice plates for accurate field fit

2.8 WORKMANSHIP

A. General
   1. Miscellaneous metal work shall be fabricated by an experienced fabricator or manufacturer and installed by an experienced tradesman.
   2. Materials, methods of fabrication, fitting, assembly, bracing, supporting, fastening, operating devices, and erection shall be in accordance with drawings and specifications, approved shop drawings, and best practices of the industry, using new and clean materials as specified, having structural properties sufficient to safely sustain or withstand stresses and strains to which materials and assembled work will be subjected.
   3. All work shall be accurately and neatly fabricated, assembled and erected.

B. Shop Assembly: Insofar as practicable, fitting and assembly of work shall be done in shop. Shop assemble work in largest practical sizes to minimize field work. It is the responsibility of the miscellaneous metal subcontractor to assure himself that the shop-fabricated miscellaneous metal items will properly fit the field condition. In the event that shop-fabricated miscellaneous metal items do not fit the field condition, the item shall be returned to the shop for correction.

C. Cutting: Cut metal by sawing, shearing, or blanking. Flame cutting will be permitted only if cut edges are ground back to clean, smooth edges. Make cuts accurate, clean, sharp and free of burrs, without deforming adjacent surfaces or metals.

D. Holes: Drill or cleanly punch holes; do not burn.

E. Connections: Make connections with tight joints, capable of developing full strength of member, flush unless indicated otherwise, formed to exclude water where exposed to weather. Locate joints where least conspicuous. Unless indicated otherwise, weld or bolt shop connections; bolt or screw field connections. Provide expansion and contraction joints to allow for thermal movement of metal at locations and by methods approved by Architect.
   1. Welding
      a. Shall be in accordance with "Standard Code for Welding in Building Construction" of the American Welding Society, and shall be done with electrodes and/or methods recommended by the manufacturer of the metals being welded.
      b. Welds shall be continuous, except where spot welding is specifically permitted. Welds exposed to view shall be ground flush and dressed smooth with and to match finish of adjoining surfaces; undercut metal edges where welds are required to be flush.
      c. All welds on or behind surfaces which will be exposed to view shall be done to prevent distortion of finished surface. Remove weld spatter and welding oxides from all welded surfaces.
   2. Bolts and Screws: Make threaded connections tight with threads entirely concealed. Use lock nuts. Bolts and screw heads exposed to view shall be flat and countersunk. Cut off projecting ends of exposed bolts and screws flush with nuts or adjacent metal.

F. Operating Mechanism: Operating devices (i.e. pivots, hinges, etc.) mechanism and hardware used in connection with this work shall be fabricated, assembled, installed and adjusted after installation so that they will operate smoothly, freely, noiselessly and without excessive friction.

G. Built-In Work: Furnish anchor bolts, inserts, plates and any other anchorage devices, and all other items specified under this Section of the Specifications to be built into concrete, masonry or work of other trades, with necessary templates and instructions, and in ample time to facilitate proper placing and installation.

H. Supplementary Parts: Provide as necessary to complete each item of work, even though such supplementary parts are not shown or specified.

I. Coordination: Accurately cut, fit, drill and tap work of this Section to accommodate and fit work of other trades. Furnish or obtain, as applicable, templates and drawings to or from applicable trades for proper coordination of this work.

J. Exposed Work
   1. In addition to requirements specified herein and shown on drawings, all surfaces exposed to view shall be clean and free from dirt, stains, grease, scratches, distortions, waves, dents, buckles, tool marks, burrs, and other defects which mar appearance of finished work.
   2. Metal work exposed to view shall be straight and true to line or curve, smooth arrises and angles as sharp as practicable, miters formed in true alignment, profiles accurately intersecting, and with joints carefully matched to produce continuity of line and design.
   3. Exposed fastenings, where permitted, shall be of the same material, color and finish as the metal to which applied, unless otherwise indicated, and shall be of the smallest practicable

size.

K. Preparation for Hot-Dip Galvanizing: Fabricator shall correctly prepare assemblies for galvanizing in consultation with galvanizer and in accordance with applicable Reference Standards and applicable AGA publications for the "Design of Products to be Hot-Dip galvanized After Fabrication." Preparation shall include but not be limited to the following:
   1. Remove welding flux.
   2. Drill appropriate vent holes and provide for drainage in inconspicuous locations of hollow sections and semi-enclosed elements. After galvanizing, plug vent holes with shaped lead and grind smooth.

2.9 MISCELLANEOUS METALS ITEMS

A. Rough Hardware
   1. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6.
   2. Fabricate items to sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood connections; elsewhere, furnish steel washers.

B. Loose Steel Lintels
   1. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
   2. Weld adjoining members together to form a single unit where indicated.
   3. Size loose lintels for equal bearing of 1 inch per foot of clear span but not less than 8 inches bearing at each side of openings, unless otherwise indicated.
   4. Loose Lintel Schedule (angle sizes, inches)
      Opening Width (Max.)

2 ft.	3-1/2 x 3-1/2 x 1/4	5 x 5 x 5/16	3-1/2 x 3-1/2 x 1/4
4 ft.	3-1/2 x 3-1/2 x 1/4	5 x 5 x 5/16	3-1/2 x 3-1/2 x 1/4
5 ft.	3-1/2 x 3-1/2 x 1/4	5 x 5 x 5/16	3-1/2 x 3-1/2 x 1/4
6 ft.	3-1/2 x 3-1/2 x 1/4	5 x 5 x 5/16	3-1/2 x 3-1/2 x 1/4

*Furnish two angles at all openings in 8 in. walls. Furnish a lintel angle for each masonry wythe.

C. Support for Suspended Toilet Partitions:
   1. Fabricate support for suspended toilet partitions as follows:
      a. Beams: Continuous steel shapes of size required to limit deflection to L/360 between
      b. hangers but use not less than C8 by 11.5 channels or another shape with equivalent structural properties.
      c. Hangers: Steel rods, 1/2-inch minimum diameter, spaced not more than 36 inches o.c. Thread rods to receive anchor and stop nuts. Fit hangers with wedge-shaped washers for full bearing on sloping flanges of support beam.
      d. Braces and Angles: Steel angles of size required for rigid support of beam and for secure anchorage.

D. STEEL STAIR NOSINGS
   1. Fabricate units of materials, sizes and configurations indicated. If not indicated, provide cast-iron units with an integral abrasive finish. Furnish in lengths as required to accurately fit each opening or conditions.
      a. Cast units with an integral abrasive grit consisting of aluminum oxide, silicon carbide, or a combination of both.
   2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include the following (approved equals will also be accepted):
      a. American Safety Tread Co., Inc.
      b. Amstep Products.
      c. Armstrong Products, Inc.
      d. Balco/Metalines,lnc.
      e. Safe-T -Metal, Inc.
      f. Wooster Products Inc.
      g. Or an Approved Equal.
   3. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with the manufacturer.
   4. Apply black asphaltic coating to concealed bottoms, sides and edges of cast-iron units set into concrete.
   5. Provide cross-hatched surfaces unless otherwise indicated.
   6. Installation, General: Center nosings on tread widths with noses flush with riser faces and tread surfaces. Install with anchorage system indicated to comply with manufacturer's recommendations.

E. TELEVISION BRACKETS
   1. Provide ceiling mounted television bracket, equal to Jumbo JMC-650D as manufactured by Peerless Industries, Or Approved Equal. Verify television sizes in field, and provide appropriate size per manufacturer's recommendations.
   2. Unit shall be complete· with accessories, hangers and hardware. Provide additional framing as required to attach television bracket to suspended framing above hung ceiling. Provide additional cold rolled steel concealed framing as required to support 150# loading and comply with the NYC Building Code.44

F. Ladders
   1. Vertical steel ladders shall be eighteen (18) inches wide with 3/4" diameter non-slip steel rungs spaced twelve (12) inches o.c. Stringers shall be 3/8" thick by 2-1/2" wide steel bars; rungs welded to bars. Attach ladders to walls six (6) inches from top and bottom and maximum thirty-six (36) inches o.c. from these points.
   2. Ladders shall be fabricated to support a live load of one hundred (100) lbs. per square foot and a concentrated load of three hundred (300) lbs. per rung; loads not to act simultaneously.

G. Steel Pipe Handrails
   1. Steel pipe of size shown on Drawings, Schedule 40. Fittings shall be flush type, malleable of cast iron. Brackets shall be malleable iron, design as selected by the Architect.
   2. Construction: Form direction changes in rails using solid bar stock or elbows. Connections shall be shop welded and ground smooth and flush, except where field connections and expansion joints are required. Field connections may be welded, internal sleeve and plug

weld, or internal sleeve and set screw.

3. Secure handrails to walls with wall brackets. Provide brackets of malleable iron castings, with no more than three (3) inches clearance from inside face of handrail to wall surface. Neatly drill wall plate portion of the bracket into concrete or masonry to receive bolts for concealed anchorage. For installation at drywall, Drywall trades shall provide plate to receive wall plate portion of bracket and anchor or bolt wall plate through drywall to supporting steel plate. Locate brackets at not more than 5'-0" o.c. unless otherwise shown.
4. Provide wall return fittings of cast iron, flush type, with the same projection as that specified for wall brackets.
5. Longitudinal members shall be parallel with each other and with floor surface or shape of stair to a tolerance of 1/8" in 10'-0" linear feet. Center line of members within each run of railing shall be in the plane.
6. For steel pipe posts where indicated, anchor posts in concrete by means of pipe sleeves set and anchored into concrete. Provide sleeves of galvanized steel pipe, not less than six (6) inches long and having an inside diameter not less than 1/2" greater than outside diameter of the inserted pipe. Provide steel plate closure secure to bottom of sleeve and of width and length not less than one (1) inch greater than outside diameter of sleeve. After posts have been inserted into sleeves, fill annular space between post and sleeve solid with non- shrink, non-ferrous grout. Cover anchorage joint with a round steel flange welded to post. Posts shall be set plumb within 1/8" vertical tolerance.
7. Steel pipe handrails shall be capable of resisting a two hundred (200) lb. force applied to rail from any direction and a uniformly distributed load of fifty (50) lbs. per linear foot applied downward or horizontally, loads not to act simultaneously.
8. Provide powder coated galvanized steel pipe railings, guardrails and supports as shown, with smooth bends and welded joints; complete with sleeves, brackets, bolts and fastening devices as required for a complete installation.
9. Provide expansion joints at intervals not to exceed 40 ft. unless otherwise shown. Provide slip joints with internal sleeves extending 2 in. minimum beyond joint each side. Fasten internal sleeve securely to one side without exposed fasteners. Locate joints within 6 in. of posts as shown.

H. Miscellaneous Light Steel Framing

1. Light steel framing, bracing, supports, framing, clip angles, shelf angles, plates, etc., shall be of such shapes and sizes as indicated on the drawings and details or as required to suit the condition and shall be provided with all necessary supports and reinforcing such as hangers, braces, struts, clip angles, anchors, bolts, nuts, welds, etc., as required to properly support and rigidly fasten and anchor same in place and to steel, concrete, masonry and all other connecting and adjoining work.
2. All light steel framing steel shall be furnished and erected in accordance with the applicable requirements of the "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" by the American Institute of Steel Construction and as specified herein.

I. Steel Gratings and Frames

1. Provide hot dipped galvanized steel gratings complying with FS RR-G-661 with rectangular cross bars welded to bearing bars. Bars to have plain wearing surface.
2. Manufacturer: Provide gratings manufactured by Reliance, Borden, Irving Subway Grating, Or an Approved Equal.
3. Hinged Section: Provide hinged sections in areaway gratings where required by the

drawings. Each hinged section up to 4'-0" wide shall be provided with two (2) five knuckle, fast pin, regular weight, plain bearing, wrought bronze butt hinges. Each hinged section over 4'-0" wide shall be provided with three (3) butt hinges. Hinged sections shall have provisions for padlocking on the underside.

4. Furnish grating frames, with corners mitered, welded and ground smooth, and with welded-on straps for secure anchorage into concrete. Frames and anchors to be galvanized.
5. Structural Performance: Provide gratings capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections:
    a. Floors: Capable of withstanding a uniform load of 250 lbf/sq. ft. or a concentrated load of 3000 lbf, whichever produces the greater stress.
    b. Walkways and Elevated Platforms Other Than Exits: Capable of withstanding a uniform load of 600 lbf/sq. ft. Limit deflection to L/360 or 1/4", whichever is less.
    c. Walkways and Elevated Platforms Used as Exits: Capable of withstanding a uniform of 100 lbf/sq. ft. or a concentrated load of 300 lbf on an area of 4 sq. in., whichever produces the greater stress. Limit deflection to L/360 or 1/4", whichever is less.
    d. Sidewalks and Vehicular Driveways: Capable of withstanding a uniform load of 250 lfb/sq. ft. or a concentrated load of 8000 lbf, whichever produces the greater stress.

J. Countertop Supports: Steel framing as indicated or required to support countertops. Conceal framing under countertops and within wall behind countertops. Provide supports to withstand a concentrated load of not less than three hundred (300) lbs. applied at any point with a deflection not to exceed L/240 for the length of the countertop.

K. Miscellaneous Steel Trim: Provide shapes and sizes for profiles shown. Except as otherwise indicated, fabricate units from structural steel shapes and plates and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings and anchorages as required for coordination of assembly and installation with other work.

L. Miscellaneous Metal Framing: Provide shapes and sizes for profiles shown. Provide channels, fittings and hardware to comply with UL 5B. This includes strut type channel raceways and fittings. Use concealed field splices wherever possible. Provide cutouts, fittings and anchorages as required for coordination of assembly and installation with other work.

M. Loose Bearing and Leveling Plates: Provide galvanized steel loose bearing and leveling plates for steel items bearing on masonry or concrete construction, fabricated flat, free from warps or twists and of required thickness and bearing area. Provide integral anchorages as indicated or if not indicated as required for a complete installation.

N. Metal Gratings For Access Floor
    1. Grating Products shall be designed and manufactured to meet the live load conditions of 300 lbs./ Sq Ft with maximum deflection of 1/8” for the clear spans shown on the drawings. Bearing bar depth shall be as shown on the contract drawings or as recommended by the manufacturer to meet the loading requirements, clear span conditions and maximum deflections specified.
        a. Design is based upon use of gratings as manufactured by Hendrick Architectural Products, and terminology used herein may include reference to the specific

performance or product of this manufacturer. Hendrick Architectural Products, Carbondale, PA, email: sales@hendrickarchproducts.com, phone: 877-840-0881, fax: 570-282-1506. Or an Approved Equal.

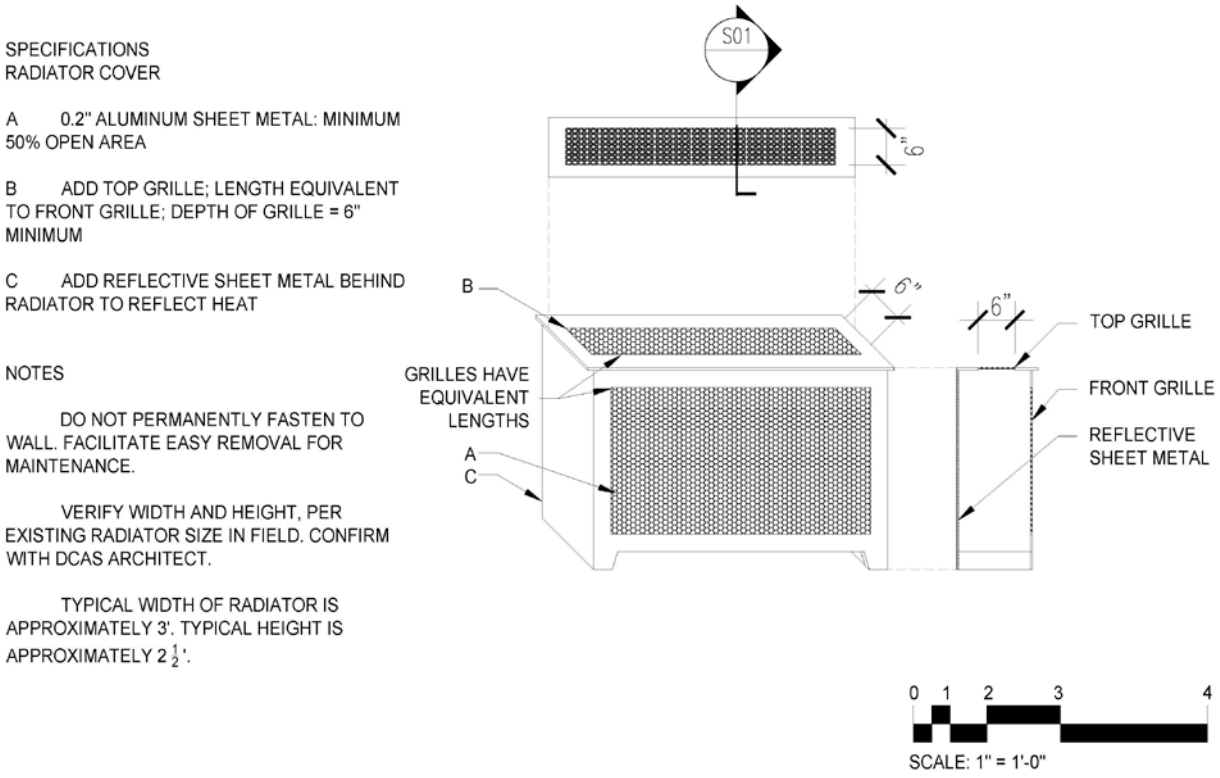
2. Materials: Bearing bars and banding are per ASTM A-666 Stainless Steel Strip- Alloy 304 and Stainless-Steel Tube Cross Bars are type ASTM A-269 Stainless Steel Tubing Alloy 304.
3. Fabrication: Fabricated using Profile Bar wires and U-clip supports from 304 or 316 stainless material. Sections to be supplied in lengths as needed with opening area as required and 0-degree deflection. Corners grates will be mitered and banded. Grating shall include hidden mounting tabs as required.
4. Fabrication Tolerances shall be in accordance with ANSI/NAAMM MBG 531-09 Metal Bar Grating Manual.
5. Finish: Gratings shall be a matte non-directional finish unless otherwise specified.
6. Accessories: Provide appropriate fasteners for type, grade, and class required for the approved anchorage system.
7. Field Verification: Take field measurements prior to preparation of final shop drawings and fabrication where required to ensure proper fitting of the work.
8. Installation: Prior to grating installation, contractor shall inspect supports for correct alignment and conditions for proper attachment and support of the gratings. Any inconsistencies between contract drawings and supporting structure deemed detrimental to grating placement shall be reported in writing to the architect or owner's agent prior to placement. Install grating in accordance with shop drawings and standard installation clearances as recommended by ANSI/NAAMM MBG-531-09 Metal Bar Grating Manual.

O. Wire Mesh Partitions

1. Wire Mesh Partitions: Provide wire mesh partitions of dimensions and locations as shown. Unless otherwise shown provide 1-1/2 in. diamond mesh, 10 gauge wire, secured into standard channel frame and intermediate crossbars. Provide doors of same construction as partition with a lock panel, locking mechanism, lockset and other finish hardware as required. Provide the following; or an Approved Equal.
   a. "Type 130A" (Acorn Wire & Iron Works, Inc.) or an Approved equal.

P. Radiator Covers

1. 0.2" Aluminum sheet metal. Minimum 50% open area.
2. Provide top grille; length equivalent to front grille; depth of grille equal 6" minimum.
3. Provide reflective sheet metal behind radiator to reflect heat.
4. Unit not to be permanently fasten to wall. Facilitate easy removal for maintenance.
5. Coordinate width and height per existing radiator size in field. Confirm with DCAS Architect.
6. Typical width of radiator is approximately 3'-0".
7. Typical height of radiator is approximately 2'-6".



Q. Miscellaneous Framing And Supports

1. Steel Framing, Subframing and Supports: Provide steel framing and subframing and supports for applications shown and not specifically provided as part of the work of other trades.
2. Fabricate units to sizes, shapes, and profiles indicated and required to receive other adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.
    a. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.
    b. Except as otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.
3. Steel Weld Plates and Angles: Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for embedding in concrete.
4. Items Required for Framing and Supporting Woodwork and Other Types of Items: Furnish bent, or otherwise custom fabricated, bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork and other type items, and for anchoring or securing woodwork and other type items, to concrete or other structures. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable iron washers for heads and nuts that bear on wood structural connections, and furnish steel washers elsewhere.
5. Fabrication of Miscellaneous Units: Fabricate miscellaneous units to sizes, shapes and

profiles shown or, if not shown, of required dimensions to receive adjacent work to be retained by framing. Fabricate from structural steel shapes and plates and steel bars, of welded construction using mitered joints for field connection, except where otherwise shown. Cut, drill and tap units to receive hardware and similar items.

6. Anchors and Inserts: Provide units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.
   a. Space anchors 24 in. o.c. and provide minimum anchor units of 1-1/4 in. x 8 in x 3 in. steel straps, except as otherwise shown.
7. Steel Tube Supports for Countertops: Utilize steel tube supports sized to support dead loads of countertops, and in addition a uniform live load of 300 psf . Where exposed in the finish work, provide welded connections, ground smooth and primed for field painting specified in Section 099100 "Painting". Where concealed, utilize bolts and connectors of capacity required to support imposed live and dead loads. Anchor steel tubes to structural walls and slabs as required for a secure and rigid installations. Fasten tubes to countertops with fasteners applied through the tubes into the underside of tops, and in sufficient quantity for a secure installation.

2.10 FINISHES, GENERAL

A. Comply with NAAMM “Metal Finishes Manual” for recommendations relative to applying and designing finishes.

B. Finish metal fabrications after assembly.

2.11 STEEL AND IRON FINISHES

A. Galvanizing: For those items required to be galvanized, apply zinc coating by the hot-dip process complying with the following requirements with a minimum G60 coating:
   1. ASTM A 153 for galvanizing iron and steel hardware.
   2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick or thicker.

B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
   1. Interiors (SSPC Zone 1A): SSPC-SP 3 “Power Tool Cleaning.”

C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA I “Paint Application Specification No. 1” for shop painting.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.12 SHOP PAINT:

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified- alkyd primer complying with performance requirements of FS TT-P-664, selected for good resistance

to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

B. Shop prime all non-galvanized miscellaneous metal items using Series 88 Azeron Primer made by Tnemec, ICI Devoe "Rust Guard" quick dry alkyd shop coat No. 41403, or "Interlac 393" by International Protection Coatings; Or an Approved Equal.
   1. If steel is to receive high performance coating as noted in Section 099100, shop prime using primer noted in Section 099100 “Painting”.

C. Bituminous Paint: Cold applied asphalt emulsion complying with ASTM D 1187.

D. Galvanize Repair Coating: For touching up galvanized surfaces after erection, provide repair coating that is V.O.C. compliant, equal to "Silver Galv" made by Z.R.C. Worldwide; or an Approved Equal. Apply to a dry film thickness of 1.5 to 3.0 mils.

2.13 PRIME PAINTING

A. Scope: All ferrous metal (except galvanized steel) shall be cleaned and shop painted with one coat of specified ferrous metal primer. No shop prime paint required on galvanized steel or aluminum work. Provide primer and finish paint as supplied by a single manufacturer for the entire project.
   1. Exterior Ferrous Metal Primer: Compatible with finish coats of paint; shop apply primer to the respective dry film mil thickness specified or as recommended by the manufacturer; Provide one of the following:
      a. "Hi-Build Epoxoline II Series N69" (Tnemec Co. Inc.); 4.0- 6.0 mils d.f.t.
      b. "Carboguard 888 Series" (Carboline Co.); 4.0- 6.0 mils d.f.t.
      c. "Amercoat 383 H" (Ameron Protective Coatings); 4.0- 6.0 mils d.f.t.
      d. Or an Approved Equal
   2. Finish Paint For Exterior Exposed Ferrous Metals, Dunnage and Elsewhere as Shown or Required: Color as selected by the Consultant. Shop finish paint apply to the respective dry film mil thickness specified or as recommended by the manufacturer; one of the following:
      a. "Carbothane 133 Series/833" (Carboline Co.). 3.0- 5.0 mils d.f.t.
      b. "Endura-Shield II 1075" (Tnemec Co. Inc.); 3.0- 5.0 mils d.f.t.
      c. "Amercoat 450 Series” (Ameron Products). 2.0 – 3.0 mils d.f.t.
      d. Or an Approved Equal
   3. Interior Ferrous Metal Primer: Compatible with the finish coats of paint (see Division 9 "Painting" for finish coats of Paint); shop apply primer to the respective dry film mil thickness specified or as recommended by the manufacturer; Provide one of the following:
      a. "Series 10-99" (Tnemec Co. Inc.); 2.0- 3.5 mils d.f.t.
      b. "Carbocoat 115" (Carboline Co.); 1.5- 2.0 mils d.f.t.
      c. "Amercoat 5105" (Ameron Protective Coatings); 2.0- 3.0 mils d.f.t.
      d. Or an Approved Equal.
   4. Thermoset Powder Coat Finish: Provide electrostatically sprayed thermoset powder coat finish on metal fabrications as noted. Heat catalyzed organic polyester or urethane powder coat applied over prime coat providing a smooth, uniform and durable finish complying with the following (the following system is based on Akzo Nobel “Interpon 2000”, other similar

systems; or an Approved Equal shall be acceptable).

a. Thickness: 2.4 -3.2 mils (60-80 microns).
b. Pencil Hardness: 2H or better in accordance with ASTM D3363.
c. Salt Spray Resistance: 3000 hrs or better in accordance with ISO7253; no blistering.
d. Humidity Resistance: 1000 hrs or better in accordance with ISO6270; no blistering.
e. Impact Test: Up to 80 in./lb. In accordance with ASTM D2794; No appearance of cracks.
f. Flexibility: ISO1519 and Qualicoat Class 2: Pass
g. Shop Preparation for Powder Coat Finish on Special Steel Door Frames (not welded subframe): Manufacturer's standard shop preparation to passivate galvanized coatings and application of epoxy or zinc rich primer compatible with finish paint coats (standard with the manufacturer). Provide custom colors and sheen which shall match custom color sample on file in Consultant's office.
h. Color: Custom colors as selected by Consultant.

5. Galvanizing Repair Paint: Zinc rich paint for repairing galvanized surfaces and field welds complying with requirements of ASTM A780. Thickness of applied galvanizing repair paint shall be not less than coating thickness required by ASTM A123 or ASTM A153 as applicable.
6. Dielectric Separator: Cold applied, asphalt emulsion type complying with ASTM D1187, non-sagging, resistant to severe corrosion conditions; applied in two coats for an overall minimum dry film thickness of 25 mils or heavy coating of epoxy paint in minimum 2.0 mils dry film thickness.

B. Cleaning: Conform to Steel Structures Painting Council Surface Preparation Specification SP 3 (latest edition) "Power Tool Cleaning" for cleaning of ferrous metals which are to receive shop prime coat.
   1. Steel to get high performance coating as noted in Division 9 Section “Painting“ shall be cleaned as per SSPC SP.6 "Commercial Blast Cleaning."

C. Application
   1. Apply shop prime coat immediately after cleaning metal. Apply paint in dry weather or under cover. Metal surfaces shall be free from frost or moisture when painted. Paint all metal surfaces including edges, joints, holes, corners, etc.
   2. Paint surfaces which will be concealed after shop assembly prior to such assembly. Apply paint in accordance with approved paint manufacturer's printed instructions, and the use of any thinners, adulterants or admixtures shall be only as stated in said instructions.
   3. Paint shall uniformly and completely cover the metal surfaces, 2.0 mils minimum dry film thickness. No work shall be shipped until the shop prime coat thereon has dried.

D. Touch-Up: In the shop, after assembly and in the field, after installation of work of this Section, touch-up damaged or abraded portions of shop prime paint with specified ferrous metal primer.

E. Apply one shop coat to fabricated metal items, except apply two (2) coats of paint to surfaces inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.

2.14 GALVANIZING

A. Scope: All ferrous metal exposed to the weather, and all ferrous metals indicated on drawings or in specifications to be galvanized, shall be cleaned and then hot-dipped galvanized after fabrication as provided by Duncan Galvanizing; or an Approved Equal.

B. Avoid fabrication techniques that could cause distortion or embrittlement of steel items to be hot-dip galvanized. Fabricator shall consult with hot-dip galvanizer regarding potential warpage problems or handling problems during the galvanizing process that may require adjustment of fabrication techniques or design before finalizing shop drawings and beginning of fabrication.

C. Cleaning: Thoroughly clean metal surfaces of all mill scale, rust, dirt, grease, oil, moisture and other contaminants prior to galvanizing.

D. Application: Hot-dip galvanizing shall be applied in accordance with:
   1. ASTM A 143: Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel.
   2. ASTM A 123: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   3. ASTM A 153: Galvanized Coating on Iron and Steel Hardware- Table 1.
   4. ASTM A 385: Practice for Providing High Quality Zinc Coatings.
   5. ASTM A 924: Galvanized Coating on Steel Sheets.
   6. Minimum weight of galvanized coating shall be two (2) oz. per square foot of surface.

E. Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.

F. All galvanized materials must be inspected for compliance with these specifications and marked with a stamp indicating the name of the galvanizer, the weight of the coating, and the appropriate ASTM number.

G. To minimize surface imperfection (eg: flux inclusions), material to be galvanized shall be dipped into a solution of Zinc Ammonium Chloride (pre-flux) immediately prior to galvanizing. The type of galvanizing process utilizing a flux blanket overlaying the molten zinc will not be permitted.

H. After galvanizing all materials not exposed to view must be chromated by dipping material in a 0.2% chromic acid solution.

I. Galvanized surfaces, where exposed to view, must have a smooth, level surface finish. Where this does not occur, piece shall be rejected and replaced to the acceptance of the Architect.

2.15 PROTECTIVE COATINGS

A. Whenever dissimilar metals will be in contact, separate contact surfaces by coating each contact surface prior to assembly or installation with one coat of specified bituminous paint, which shall be in addition to the specified shop prime paint. Mask off those surfaces not required to receive protective coating.

PART 3 EXECUTION

3.1 PREPARATION

A. Coordination: Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

B. Inspection: Examine the areas and conditions where miscellaneous metal is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

C. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer.

3.2 INSTALLATION, GENERAL

A. Manufacturer's Instructions: Prepare substrates and install the work of this Section, including, components and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

B. Install work as shown, plumb, level and in line with adjacent materials where required. Provide fastenings as indicated on the Drawings, specified herein or as shown on final shop drawings.

C. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

D. Cutting, Fitting, and Placement: Perform cutting, drilling, and fining required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

F. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Grind exposed joints smooth and touch up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot dip galvanized after fabrication, and are intended for bolted or screwed field connections.

G. Field Welding: Comply with the following requirements:
   1. Comply with AWS Welding Code for procedures related to field welding as related to appearance and quality of welds made and for methods used in correcting welding work.

2. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
3. Obtain fusion without undercut or overlap.
4. Remove welding flux immediately.
5. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

H. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

I. Field Touch-Up of Galvanized Surfaces: Touch-up shop applied galvanized coatings damaged during handling and installation. Use galvanizing repair coating specified herein for galvanized surfaces.

J. Steel Weld Plates and Angles: Coordinate installation of steel weld plates and angles for casting into concrete construction that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

K. Anchorages: Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including steel weld plates and angles, concrete inserts, sleeves, anchor bolts and other miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to the project site. Deliver items which are to be built into the work of other Sections in time so as not to delay the progress of the Work.

L. Procedures for Fastening Metal Work: Except where otherwise specified for a particular item for built-in work, fasten metal work to concrete or solid masonry with embedded anchors or expansion bolts, and to hollow block with toggle bolts. Fastening to wood plugs will not be permitted. Drill holes for bolts to the exact diameter of the bolt. Provide screws threaded full length to the screw head.

M. Protection of Finished Surfaces: Protect finished surfaces against damage during construction and remove protection at time of substantial completion.

N. Dissimilar Materials: Separate dissimilar metals with heavy coating of dielectric separator. Do not extend coating onto exposed or finished surfaces.

3.3 SETTING LOOSE PLATES

A. Prior to setting loose bearing and setting plates clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

B. Set loose leveling and bearing plates on wedges or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.

1. Use non-shrink, grout unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 INSTALLING SUPPORTS FOR TOILET PARTITIONS

A. Anchor supports securely to and rigidly brace from overhead building structure.

3.5 VERTICAL LADDERS, INDUSTRIAL TYPE LADDERS:

A. Provide vertical ladders, industrial type ladders at all locations requiring access to equipment, catwalks, or gratings.

B. Procedures for Securing Vertical Ladders: Secure vertical ladders to masonry or concrete with a minimum of two 1/2 in. diameter expansion bolts at each bracket, unless additional attachments are required to sustain imposed loads.

3.6 INSTALLING GRATINGS:

A. Install grating in accordance with requirements of ANSI/NAAMM MBG 531 "Metal Bar Grating Manual" including installation clearances and standard anchoring details. Weld gratings to supporting steel, except for sections which are hinged or required to be removable. Secure removable units to supporting members with type and size of clips and fasteners as recommended by grating manufacturer for type of installation conditions shown. Do not notch bearing bars at supports to maintain elevation. Secure toe plates to gratings by welding.

3.7 INSTALLING RAILINGS:

A. Mount handrails only on completed walls. Do not support handrails temporarily by means not satisfying structural performance requirements. Mount handrails only on gypsum board assemblies reinforced to receive anchors, and where the location of concealed anchor plates has been clearly marked. Adjust railings prior to anchoring to ensure matching alignment at abutting joints. Locate posts at spacing indicated, or if not indicated, at equal intervals as required by design loadings.
   1. Anchor posts of railings into concrete by means of pipe sleeves preset and anchored into concrete. Set sleeves in concrete with tops flush with finish surface elevations and protect sleeves from water and concrete entry. After posts have been inserted into sleeves, solidly fill annular space between post and sleeve with non-shrink non-metallic grout. Cover anchorage joint with a round steel flange welded to post after placement of anchoring material.
   2. Anchor posts to steel members with steel oval flanges, angle type or floor type as required by conditions, welded to posts and bolted to steel supporting members.
   3. Secure handrails to wall with wall brackets and end fittings. Provide brackets of design shown, with flanges tapped for concealed anchorage and with not less than 1-1/2 in. clearance from inside face of handrail and finished wall surface. Located brackets as indicated, or if not indicated, at equal spacings as required by design loads.

3.8 INSTALLATION OF PIPE GUARDS:

A. Anchor pipe guards to concrete or masonry construction as shown.

3.9 NOSINGS, TREADS, AND THRESHOLDS:

A. Install with anchorage system indicated or if not indicated to comply with manufacturer's written instructions and recommendations. Seal thresholds exposed to exterior with elastomeric sealant complying with Section 079200 "Joint Sealants" to provide a watertight installation.

3.10 WIRE MESH PARTITIONS:

A. Comply with manufacturer's written instructions and recommendations for installation and as follows:
   1. Anchor wire mesh partitions to floor with 3/8 in. diameter, expansion anchors at 12 in. o.c. through floor shoes located at each post and corner. Adjust wire mesh partition posts in floor shoes to achieve level and plumb installation.
   2. Anchor wire mesh partitions to walls at 12 in. o.c. through back corner panel framing utilizing appropriate fastening devices for the substrate.
   3. Secure top capping bars to top framing channels with 1/4 in. diameter "U" bolts spaced not more than 28 in. o.c.
   4. Provide line posts at locations recommended by the manufacturer.
   5. Where standard-width wire mesh partition panels do not fill entire length of run, provide adjustable filler panels to fill openings.
   6. Install doors complete with door hardware.

3.11 FIELD QUALITY CONTROL

A. Subcontractor’s Quality Control Responsibilities: Subcontractor is solely responsible for quality control of the Work.

B. Connection Identification: Assign each bolting crew and welder an identifying symbol, and require them to mark every connection, so that an inspector may identify the person(s) making each connection.\

C. Qualification for Field Welding: Qualify the welding operators and welding procedures in accordance with AWS D1.1 and D1.3 requirements.

3.12 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
   1. Apply by brush or spray to provide a 2.0-mil minimum dry film thickness.

B. For galvanized surfaces, clean welds, bolted connections, and abraded areas, and apply galvanizing repair paint to comply with ASTM A 780.

3.13 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

END OF SECTION 055000

SECTION 055100
METAL STAIRS

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Contract Documents apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Preassembled steel stairs with concrete-filled, epoxy-resin-filled and abrasive-coating-finished formed-metal treads.
2. Industrial-type stairs with steel floor plate and or grating treads.
3. Ornamental steel-framed stairs.
4. Steel tube railings attached to metal stairs.
5. Steel tube handrails attached to walls adjacent to metal stairs.
6. Railing gates at the level of exit discharge.

B. Related Sections:
1. Division 03 Section "Cast-in-Place Concrete" for concrete fill for stair treads and platforms.
2. Division 05 Section "Metal Fabrications" for metal treads and nosings installed at locations other than in metal stairs and alternating tread devices.
3. Division 05 Section "Pipe and Tube Railings" for pipe and tube railings not attached to metal stairs or to walls adjacent to metal stairs.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design metal stairs, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
1. Uniform Load: 100 lbf/sq. ft.
2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/360 or 1/8 inch, whichever is less.

C. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
1. Handrails and Top Rails of Guards:
   a. Uniform load of 50 lbf/ ft. applied in any direction.
   b. Concentrated load of 200 lbf applied in any direction.
   c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:
   a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
   b. Infill load and other loads need not be assumed to act concurrently.

D. Seismic Performance: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. Component Importance Factor is 1.5.

1.4 ACTION SUBMITTALS

A. Product Data: For metal stairs and the following:
1. Prefilled metal-pan stair treads.
2. Precast concrete treads.
3. Epoxy-resin-filled stair treads.
4. Nonslip aggregates and nonslip-aggregate finishes.
5. Abrasive nosings.
6. Metal floor plate treads.
7. Paint products.
8. Grout.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for stairs and railings.
1. Test railings according ASTM E 894 and ASTM E 935.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.
1. Preassembled Stairs: Commercial and Service class.
2. Industrial-Type Stairs: Industrial class.
3. Ornamental Stairs: Architectural class.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code- Steel."

D. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code- Steel."
   2. AWS D1.3, "Structural Welding Code- Sheet Steel."

1.7 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Coordinate locations of hanger rods and struts with other work so that they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

PART 2- PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Tubing: ASTM A 500 (cold formed) or ASTM A 513.

D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

E. Abrasive-Surface Floor Plate: Steel plate with abrasive granules rolled into surface or with abrasive material metallically bonded to steel.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. IKG Industries, a division of Harsco Corporation; Mebac.
      b. SlipNOT Metal Safety Flooring, a W. S. Molnar company; SlipNOT.
      c. Or an Approved Equal.

F. Steel Bars for Grating Treads: ASTM A 36/A 36M or steel strip, ASTM A 1011/A 1011M or ASTM A 1018/A 1018M.

G. Wire Rod for Grating Crossbars: ASTM A 510.

H. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

I. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, either commercial steel, Type B, or structural steel, Grade 25, unless another grade is required by design loads; exposed.

J. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, Grade 30, unless another grade is required by design loads.

K. Galvanized-Steel Sheet: ASTM A 653/A 653M, G90 coating, either commercial steel, Type B, or structural steel, Grade 33, unless another grade is required by design loads.

L. Expanded-Metal, Carbon Steel: ASTM F 1267, Type I (expanded), or Type II (expanded and flattened), Class 1 (uncoated).
1. Style Designation: 3/4 number 13.

M. Perforated Metal: Cold-rolled steel sheet, ASTM A 1008/A 1008M, or hot-rolled steel sheet, ASTM A 1011/A 1011M, commercial steel Type B, 0.060-inch-thick, with 1/4-inch holes 3/8-inch o.c. in staggered rows with 1/8-by-1-inch round end slotted holes in staggered rows.

N. Perforated Metal: Galvanized-steel sheet, ASTM A 653/A 653M, G90 coating, commercial steel Type B, 0.064-inch-thick, with 1/4-inch holes 3/8-inch o.c. in staggered rows.

O. Woven-Wire Mesh: Intermediate-crimp, diamond or square pattern, 2-inch woven-wire mesh, made from 0.135-inch nominal diameter wire complying with ASTM A 510.

2.3 NONFERROUS METALS

A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.

B. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

C. Bronze Extrusions: ASTM B 455, Alloy UNS No. C38500 (extruded architectural bronze).

D. Bronze Castings: ASTM B 584, Alloy UNS No. C83600 (leaded red brass) or No. C84400 (leaded semired brass).

E. Nickel Silver Castings: ASTM B 584, Alloy UNS No. C97600 (20 percent leaded nickel bronze).

2.4 ABRASIVE NOSINGS

A. Cast-Metal Units: Cast iron, aluminum, bronze and or nickel silver, with an integral abrasive, as-

cast finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in lengths necessary to accurately fit openings or conditions.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. American Safety Tread Co., Inc.
   b. Balco Inc.
   c. Barry Pattern & Foundry Co., Inc.
   d. Granite State Casting Co.
   e. Safe-T-Metal Company, Inc.
   f. Wooster Products Inc.
   g. Or an Approved Equal.
2. Configuration: Cross-hatched units, 4 inches wide without lip.
3. Configuration: Cross-hatched angle-shaped units, same depth as bar-grating treads and 1 to 1-1/2 inches wide.

B. Extruded Units: Aluminum or Bronze units with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. ACL Industries, Inc.
   b. American Safety Tread Co., Inc.
   c. Amstep Products.
   d. Armstrong Products, Inc.
   e. Balco Inc.
   f. Granite State Casting Co.
   g. Wooster Products Inc.
   h. Or an Approved Equal.
2. Provide ribbed units, with abrasive filler strips projecting 1/16 inch above aluminum extrusion.
3. Provide solid-abrasive-type units without ribs.
4. Nosings: Square-back units, 1-7/8 inches, 3 inches and or 4 inches wide, without lip.
5. Nosings: Two-piece units, 3 inches wide, with subchannel for casting into concrete.

C. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

D. Apply bituminous paint to concealed surfaces of cast-metal units set into concrete.

E. Apply clear lacquer to concealed surfaces of extruded units set into concrete.

2.5 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
   1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for exterior stairs, stairs indicated to be galvanized, or stairs indicated to be shop primed with zinc-rich primer.

D. Machine Screws: ASME B18.6.3.

E. Lag Screws: ASME B18.2.1.

F. Plain Washers: Round, ASME B18.22.1.

G. Lock Washers: Helical, spring type, ASME B18.21.1.

H. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
   1. Material fr Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
   2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.6 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
   1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for

interior and exterior applications.

H. Concrete Materials and Properties: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.

I. Nonslip-Aggregate Concrete Finish: Factory-packaged abrasive aggregate made from fused, aluminum-oxide grits or crushed emery; rustproof and nonglazing; unaffected by freezing, moisture, or cleaning materials.

J. Welded Wire Fabric: ASTM A 185/A 185M, 6 by 6 inches, W1.4 by W1.4, unless otherwise indicated.

2.7 PRECAST CONCRETE TREADS

A. Concrete Materials and Properties: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, ready-mixed concrete with a minimum 28-day compressive strength of 5000 psi and a total air content of not less than 4 percent or more than 6 percent.

B. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2 inches by 0.062-inch-diameter wire; comply with ASTM A 185/A 185M and ASTM A 82/A 82M, except for minimum wire size.

2.8 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts, [railings,] clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
   1. Join components by welding unless otherwise indicated.
   2. Use connections that maintain structural value of joined pieces.
   3. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.

B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion

resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Weld exposed corners and seams continuously unless otherwise indicated.
5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

H. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.9 STEEL-FRAMED STAIRS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Alfab, Inc.
2. American Stair, Inc.
3. Sharon Companies Ltd. (The).
4. Or an Approved Equal.

B. Stair Framing:
1. Fabricate stringers of steel plates or channel as specified on drawings.
a. Provide closures for exposed ends of channel stringers.
2. Construct platforms of steel plate or channel headers and miscellaneous framing members as needed to comply with performance requirements.
3. Weld or bolt stringers to headers; weld or bolt framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
4. Where stairs are enclosed by gypsum board or shaft-wall assemblies, provide hanger rods or struts to support landings from floor construction above or below. Locate hanger rods and struts where they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.
5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

C. Metal-Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.067 inch as indicated.
1. Steel Sheet: Uncoated cold-rolled steel sheet or unless otherwise indicated.
2. Steel Sheet: Galvanized-steel sheet, where indicated.
3. Directly weld metal pans to stringers; locate welds on top of subtreads where they will be concealed by concrete fill. Do not weld risers to stringers.
4. Attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.

5. Shape metal pans to include nosing integral with riser.
6. Attach abrasive nosings to risers.
7. At Contractor's option, provide stair assemblies with metal-pan subtreads filled with reinforced concrete during fabrication.
8. Provide epoxy-resin-filled treads, reinforced with glass fibers, with slip-resistant, abrasive surface.
9. Provide sub platforms of configuration indicated or, if not indicated, the same as subtreads. Weld sub platforms to platform framing.
    a. Smooth Soffit Construction: Construct subplatforms with flat metal under surfaces to produce smooth soffits.

D. Abrasive-Coating-Finished, Formed-Metal Stairs: Form risers, treads, and platforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.097 inch or as indicated.
1. Steel Sheet: Uncoated hot-rolled steel sheet unless otherwise indicated.
2. Directly weld risers and treads to stringers; locate welds on underside of stairs.
3. Provide platforms of configuration indicated or, if not indicated, the same as treads. Weld platforms to platform framing.
4. Finish tread and platform surfaces with manufacturer's standard epoxy-bonded abrasive finish.

E. Metal Floor Plate Stairs: Form treads and platforms to configurations shown from rolled-steel or abrasive-surface floor plate of thickness needed to comply with performance requirements, but not less than 1/4 inch or as indicated.
1. Form treads with integral nosing and back edge stiffener. Form risers of same material as treads.
2. Form treads with integral nosing and back edge stiffener. Form risers from steel sheet not less than 0.097-inch-thick, welded to tread nosings and stiffeners and to platforms.
3. Form treads with integral nosing and back edge stiffener, and with open risers.
4. Weld steel supporting brackets to stringers and weld treads to brackets.
5. Fabricate platforms with integral nosings matching treads and weld to platform framing.

F. Metal Bar-Grating Stairs: Form treads and platforms to configurations shown from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manual."
1. Fabricate treads and platforms from welded or pressure-locked steel grating with 1-1/4-by-3/16-inch bearing bars at 15/16-inch o.c., 1-by-3/16-inch bearing bars at 11/16-inch o.c. 1-by-1/8-inch bearing bars at 7/16-inch o.c. and crossbars at 4 inches o.c.
2. Fabricate treads and platforms from welded or pressure-locked steel grating with openings in gratings no more than 1/2 inch in least dimension.
3. Surface: Plain.
4. Finish: Shop primed, Painted or Galvanized.
5. Fabricate grating treads with rolled-steel floor plate or cast abrasive nosing and with steel angle or steel plate carrier at each end for stringer connections. Secure treads to stringers with bolts.
6. Fabricate grating platforms with nosing matching that on grating treads. Provide toeplates at open-sided edges of grating platforms. Weld grating to platform framing.

2.10 STAIR RAILINGS

A. Comply with applicable requirements in Division 05 Section "Pipe and Tube Railings."
   1. Fabricate newels of square steel tubing and provide newel caps of pressed steel, as shown.
   2. Rails may be bent at corners, rail returns, and wall returns, instead of using prefabricated fittings.
   3. Connect posts to stair framing by direct welding unless otherwise indicated.

B. Steel Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.
   1. Rails and Posts: 1-5/8-inch- diameter or 1-1/2-inch-square top and bottom rails and 1- 1/2-inch-square posts.
   2. Picket Infill: 1/2-inch-square pickets spaced less than 4 inches clear.
   3. Expanded-Metal Infill: Expanded-metal panels edged with U-shaped channels made from steel sheet not less than 0.043 inch thick. Orient expanded metal with long dimension of diamonds parallel to top rail, perpendicular to top rail and vertical.
   4. Perforated-Metal Infill: Perforated-metal panels edged with U-shaped channels made from metal sheet, of same metal as perforated metal and not less than 0.043 inch thick.
   5. Orient perforated metal with pattern parallel to top rail, perpendicular to top rail, horizontal and or vertical as indicated on Drawings.
   6. Mesh Infill: Woven wire mesh crimped into 1-by-1/2-by-1/8-inch steel channel frames. Orient wire mesh with diamonds vertical, wires perpendicular and parallel to top rail and or wires horizontal and vertical.
   7. Intermediate Rails Infill: 1-5/8-inch-diameter or 1-1/2-inch-square intermediate rails spaced less than 12 inches clear.

C. Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
   1. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint.

D. Form changes in direction of railings as follows:
   1. As detailed.
   2. By bending.
   3. By flush bends.
   4. By radius bends of radius indicated.
   5. By inserting prefabricated elbow fittings.

E. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

F. Close exposed ends of railing members with prefabricated end fittings.

G. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
   1. Connect posts to stair framing by direct welding unless otherwise indicated.
   2. For galvanized railings, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous-metal components.
   3. For nongalvanized railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.

I. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.11 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal stairs after assembly.

C. Galvanizing: Hot dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
   1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
   2. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

D. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning." or SSPC-SP 3, "Power Tool Cleaning."
   1. Exterior Stairs: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   2. Interior Stairs: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   3. Interior Stairs: SSPC-SP 3, "Power Tool Cleaning."

E. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3- EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for

securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

F. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.

G. Place and finish concrete fill for treads and platforms to comply with Division 03 Section "Cast-in-Place Concrete."
   1. Install abrasive nosings with anchors fully embedded in concrete. Center nosings on tread width.

H. Install precast concrete treads with adhesive supplied by manufacturer.

3.2 INSTALLING METAL STAIRS WITH GROUTED BASEPLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of baseplates.

B. Set steel stair baseplates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
   1. Use nonmetallic, nonshrink grout unless otherwise indicated.
   2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 INSTALLING RAILINGS

A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:
   1. Anchor posts to steel by welding directly to steel supporting members.
   2. Anchor handrail ends to concrete and masonry with round steel flanges welded to rail ends and anchored with postinstalled anchors and bolts.

B. Attach handrails to wall with wall brackets. Use type of bracket with predrilled hole for exposed bolt anchorage. Provide bracket with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as required to comply with performance requirements.
   1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
   2. For hollow masonry anchorage, use toggle bolts.
   3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
   4. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.
   5. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.
   6. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and braded areas of shop paint are specified in Division 09 Section "High-Performance Coatings."

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055100

SECTION 055213
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Steel pipe and tube railings.

B. Related Sections:
   1. Division 06 Section “Rough Carpentry” for wood blocking for anchoring railings.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
   1. Steel: 72 percent of minimum yield strength.

C. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Handrails and Top Rails of Guards:
      a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
      b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.

   2. Infill of Guards:
      a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
      b. Infill load and other loads need not be assumed to act concurrently.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling,
   opening of joints, overstressing of components, failure of connections, and other detrimental effects.
   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Manufacturer's product lines of mechanically connected railings.
2. Railing brackets.
3. Grout, anchoring cement, and paint products.

B. Shop drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Initial Selection: For products involving selection of color, texture, or design.

D. Samples for Verification: For each type of exposed finish required.
1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
2. Fittings and brackets.
3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.
a. Show method of finishing members at intersections.

E. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code- Steel."

C. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code- Steel."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.7 COORDINATION AND SCHEDULING

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2- PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following.
   1. Steel Pipe and Tube Railings, as manufactured by:
      a. Pisor Industries, Inc.
      b. Wagner, R & B, Inc.; a division of the Wagner Companies.
      c. Or an Approved Equal.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.3 STEEL AND IRON

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Tubing: ASTM A 500 (cold formed).

C. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
   1. Provide galvanized finish for exterior installations and where indicated.

D. Plates, Shapes, and Bars: ASTM A 36/A 36M.

E. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A

47M, unless otherwise indicated.

2.4 FASTENERS

A. General: Provide the following:
   1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5 for zinc coating.
   2. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:
   1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
   2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
   3. Provide square or hex socket flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
   1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

E. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

F. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

G. Shop Primer for Galvanized Steel: water base galvanized metal primer complying with MPI#134.

H. Intermediate Coats and Topcoats: Provide products that comply Division 09 painting Section.

I. Epoxy Intermediate Coat: Complying with MPI#77 and compatible with primer and topcoat.

J. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

K. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

L. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
1. Water-Resistant Product: where indicated provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.6 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage**,** but not less than that required to support structural loads.

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with either welded or nonwelded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove flux immediately.
   4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

I. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
   1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

J. Form changes in direction as follows:
   1. As detailed.

K. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

L. Close exposed ends of railing members with prefabricated end fittings.

M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.

N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
   1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

P. For railing posts set in concrete, provide steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with metal plate forming bottom closure.

Q. For removable railing posts, fabricate slip-fit sockets from steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.
   1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

R. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.7 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.8 STEEL AND IRON FINISHES

A. Galvanized Railings:
   1. Hot dip galvanized exterior steel and iron railings, including hardware, after fabrication.
   2. Hot dip galvanized indicated steel and iron railings, including hardware, after fabrication.
   3. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
   4. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
   5. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
   6. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

D. For nongalvanized steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.

E. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   1. Exterior Railings: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

2. Railings Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Railings Indicated to Receive Primers Specified in SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

F. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
1. Shop prime uncoated railings with primers specified in Division 05, unless otherwise indicated.
2. Do not apply primer to galvanized surfaces.

G. Shop-Painted Finish: Comply with Division 05, unless otherwise indicated.
1. Color: As selected by Architect from manufacturer's full range.

H. High-Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.
1. Color: As selected by Architect from manufacturer's full range.

PART 3- EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for

securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.4 ANCHORING POSTS

A. Use metal sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Form or core-drill holes as per Architectural Drawings for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.

C. Cover anchorage joint with flange of same metal as post, attached to post with set screws.

D. Leave anchorage joint exposed with anchoring material flush with adjacent surface.

E. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
   1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

F. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ATTACHING RAILINGS

A. Anchor railing ends at walls with round flanges anchored to wall construction and connected to railing ends using nonwelded connections.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and connected to railing ends using nonwelded connections.

C. Attach railings to wall with wall brackets except where end flanges are used. Provide brackets

with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

1. Use type of bracket with predrilled hole for exposed bolt anchorage.
2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

D. Secure wall brackets and railing end flanges to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For steel-framed partitions, use hanger or lag bolts set into fire-retardant- treated wood backing between studs. Coordinate with stud installation to locate backing members.
4. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.
5. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.6 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.7 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

3.8 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

END OF SECTION 055213

SECTION 055300
METAL GRATINGS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Metal bar gratings.
   2. Removable metal grating.
   3. Metal frames and supports for gratings.

B. Related Sections:
   1. Division 05 Section "Structural Steel Framing" for structural-steel framing system components.
   2. Division 05 Section "Pipe and Tube Railings" for metal pipe and tube handrails and railings.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design gratings, including comprehensive engineering analysis by a qualified professional engineer, retained by the Contractor, using performance requirements and design criteria indicated.

B. Structural Performance: Gratings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
   1. Floors: Uniform load of 125 lbf/sq. ft. (6.00 kN/sq. m) or concentrated load of 2000 lbf (8.90 kN), whichever produces the greater stress.
   2. Floors: Uniform load of 250 lbf/sq. ft. (11.97 kN/sq. m) or concentrated load of 3000 lbf (13.40 kN), whichever produces the greater stress.
   3. Walkways and Elevated Platforms Other Than Exits: Uniform load of 60 lbf/sq. ft. (2.87 kN/sq. m).
   4. Walkways and Elevated Platforms Used as Exits: Uniform load of 100 lbf/sq. ft. (4.79 kN/sq. m).
   5. Sidewalks and Vehicular Driveways, Subject to Trucking: Uniform load of 250 lbf/sq. ft. (11.97 kN/sq. m) or concentrated load of 8000 lbf (35.60 kN), whichever produces the greater stress.
   6. Limit deflection to L240.

C. Seismic Performance: Provide gratings capable of withstanding the effects of earthquake motions determined according to ASCE/SEI 7.

1.3 SUMMARY

A. Section includes metal bar gratings and metal frames and supports for gratings.

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for structural-steel framing system components.
2. Section 055100 "Metal Stairs" for grating treads and landings of steel-framed stairs.
3. Section 055213 "Pipe and Tube Railings" for metal pipe and tube handrails and railings.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Clips and anchorage devices for gratings.
   2. Paint products.

B. Shop Drawings: Include plans, sections, details, and attachments to other work.

C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer.

B. Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.

C. Welding certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.6 QUALITY ASSURANCE

A. Metal Bar Grating Standards: Comply with NAAMM MBG 531, "Metal Bar Grating Manual.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code- Steel."

C. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code- Steel."
   2. AWS D1.3, "Structural Welding Code- Sheet Steel."

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication.

1.8 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for gratings, grating frames, and supports.

C. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2- PRODUCTS

2.1 FERROUS METALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Bars for Bar Gratings: ASTM A 36/A 36M or steel strip, ASTM A 1011/A 1011M or ASTM A 1018/A 1018M.

D. Wire Rod for Bar Grating Crossbars: ASTM A 510 (ASTM A 510M).

E. Galvanized-Steel Sheet: ASTM A 653/A 653M, structural quality Grade 33 (Grade 230), with G90 (Z275) coating.

F. Expanded-Metal Galvanized Steel: ASTM F 1267, Class 2, Grade A.

2.2 FASTENERS

A. General: Unless otherwise indicated, provide for exterior use zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
   1. Hot dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

D. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).

E. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).

F. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.

2.3 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy that is welded.

B. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Primers: Provide primers that comply with Division 09 painting Section.

D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

2.4 FABRICATION

A. Shop Assembly: Fabricate grating sections in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.

D. Fit exposed connections accurately together to form hairline joints.

E. Welding: Comply with AWS recommendations and the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.

F. Provide for anchorage of type indicated, coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.
   1. Fabricate toeplates to fit grating units and weld to units in shop unless otherwise indicated.
   2. Fabricate toeplates for attaching in the field.
   3. Toeplate Height: 4 inches (100 mm) unless otherwise indicated.

2.5 METAL BAR GRATINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Alabama Metal Industries Corporation; a Gibraltar Industries company.
   2. All American Grating.
   3. BarnettBates Corporation.
   4. Borden Metal Products (Canada) Limited.
   5. Fisher & Ludlow; Division of Harris Steel Limited.
   6. Grating Pacific, Inc.
   7. Grupo Metelmex, S.A. de C.V.
   8. IKG Industries; a division of Harsco Corporation.
   9. Marwas Steel Co.; Laurel Steel Products Division.
   10. Ohio Gratings, Inc.
   11. Seidelhuber Metal Products; Division of Brodhead Steel Products.
   12. Or an Approved Equal.

B. Welded Steel Grating [MBG-<#>]:
   1. Bearing Bar Spacing: [7/16 or 1/2 inch (11 or 13 mm> o.c.
   2. Bearing Bar Depth: As required to comply with structural performance requirements.
   3. Bearing Bar Thickness: As required to comply with structural performance requirements.
   4. Crossbar Spacing: 4 inches (102 mm) o.c.
   5. Grating Mark: As indicated.
   6. Traffic Surface: As indicated.
   7. Steel Finish: Hot-dip galvanized with a coating weight of not less than 1.8 oz./sq. ft. (550 g/sq. m) of coated surface.

C. Removable Grating Sections: Fabricate with banding bars attached by welding to entire perimeter of each section. Include anchors and fasteners of type indicated or, if not indicated, as recommended by manufacturer for attaching to supports.
   1. Provide no fewer than four weld lugs for each heavy-duty grating section, with each lug shop welded to two bearing bars.
   2. Provide no fewer than four saddle clips for each grating section composed of rectangular bearing bars 3/16 inch (4.8 mm) or less in thickness and spaced 15/16 inch (24 mm) or more o.c., with each clip designed and fabricated to fit over two bearing bars.

3. Provide no fewer than four weld lugs for each grating section composed of rectangular bearing bars 3/16 inch (4.8 mm) or less in thickness and spaced less than 15/16 inch (24 mm) o.c., with each lug shop welded to three or more bearing bars. Interrupt intermediate bearing bars as necessary for fasteners securing grating to supports.
4. Provide no fewer than four flange blocks for each section of aluminum I-bar grating, with block designed to fit over lower flange of I-shaped bearing bars.
5. Furnish threaded bolts with nuts and washers for securing grating to supports.
6. Furnish self-drilling fasteners with washers for securing grating to supports.
7. Furnish galvanized malleable-iron flange clamp with galvanized bolt for securing grating to supports. Furnish as a system designed to be installed from above grating by one person.
    a. Products: Subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to, the following:
        1) Kee Industrial Products, Inc.; Grating Clip.
        2) Lindapter North America, Inc.; Grate-Fast.
        3) Or an Approved Equal.

D. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.
1. Edge-band openings in grating that interrupt four or more bearing bars with bars of same size and material as bearing bars.

E. Do not notch bearing bars at supports to maintain elevation.

2.6 GRATING FRAMES AND SUPPORTS

A. Frames and Supports for Metal Gratings: Fabricate from metal shapes, plates, and bars of welded construction to sizes, shapes, and profiles indicated and as necessary to receive gratings. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.
1. Unless otherwise indicated, fabricate from same basic metal as gratings.
2. Equip units indicated to be cast into concrete or built into masonry with integrally welded anchors. Unless otherwise indicated, space anchors 24 inches (600 mm) o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches (32 mm) wide by 1/4 inch (6 mm) thick by 8 inches (200 mm) long.

B. Galvanize steel frames and supports in the following locations:
1. Exterior.
2. Interior

2.7 STEEL FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

PART 3- EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.

D. Fit exposed connections accurately together to form hairline joints.
   1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot dip galvanized after fabrication and are for bolted or screwed field connections.

E. Attach toeplates to gratings by welding at locations indicated.

F. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.

G. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.2 INSTALLING METAL BAR GRATINGS

A. General: Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.

B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.

C. Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

3.3 ADJUSTING AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop- painted surfaces.

C. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

D. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint.

E. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

3.4 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

END OF SECTION 055300

SECTION 061000
ROUGH CARPENTRY

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the carpentry work as shown on the drawings and/ or specified herein, including but not limited to, the following:
   1. Blocking and miscellaneous wood, including wall lining for telephone and electric closets.
   2. Temporary exterior handicap ramp.
   3. Rough hardware, including nails, screws, anchors, brackets, braces, bolts, nuts, fittings, and other devices required for the proper fitting, connecting, and erecting of the Work.
   4. Plywood decking, subflooring, and underlayment.
   5. Rough hardware.
   6. Installation only of finish hardware.
   7. Installation only of doors and hollow metal frames.
   8. Rough frames for windows, grilles, louvers, loudspeakers, recesses for cabinets, and for other items, as indicated on the Drawings.
   9. Framing for stepped floors and platforms.
   10. Preservative treatment for wood.
   11. Fire-retardant treatment for wood.
   12. Miscellaneous Lumber.

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal (38 mm actual) size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) size or greater but less than 5 inches nominal (114 mm actual) size in least dimension.

C. Exposed Framing: Framing not concealed by other construction.

D. OSB: Oriented strand board

1.4 RELATED SECTIONS

A. Steel doors and frames- Section 081113.

B. Finish hardware- Section 087100.

1.5 QUALITY ASSURANCE

A. Lumber Standard: Comply with PS 20.

B. Plywood Standard: Comply with PS 1 and American Plywood Assoc. (APA).

C. Shop fabricates carpentry work to the extent feasible and where shop fabrication will result in better workmanship than feasible for on-site fabrication.

D. Grade Marks: Identify lumber and plywood by official grade mark.
   1. Lumber: Grade stamp to contain symbol of grading agency certified by Board of Review, American Lumber Standards Committee, mill number or name, grade of lumber, species grouping or combination designation, rules under which graded where applicable, and condition of seasoning at time of manufacture.
      a. MC-15 or KD: Maximum of fifteen (15) percent moisture content.

E. Installation of doors, frames and hardware shall conform to the minimum standards of "Installation Guides for Doors and Hardware" of the Door and Hardware Institute.

1.6 SUBMITTALS

A. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.

B. Fire-Retardant Treatment: Include certification by treating plant that treatment material complies with governing ordinances and that treatment will not bleed through finished surfaces.
   1. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664
   2. Product Data: Submit manufacturer's specifications and installation instructions for manufactured materials, including construction panels.
   3. Material Certificates: Submit listing of species and grade selected for framing lumber, and a signed copy of grading rules showing design, values for selected lumber. Design values shall comply with specified requirements and American Lumber Standards Committee.

C. Wood Treatment Data: Submit chemical treatment manufacturer's instructions for handling, storing, and using treated material.
   1. Submit certification by treating plant stating type of treatment, preservative retained and conformance with applicable standards.
   2. Submit a statement that moisture content of treated materials complied with levels indicated before delivery.
   3. Submit certification by treating plant that lire-retard ant-treated wood products comply with specified standards and other requirements.

1.7 PRODUCT HANDLING

A. Deliver carpentry materials to the site ready to use with each piece of lumber clearly marked as to grade, type and mill, and place in an area protected from the elements.

B. Deliver rough hardware in sealed kegs and/ or other containers which shall bear labels as to type and kind.

C. Pile lumber for rough usage, when delivered to the site in stacks to insure drainage and with a minimum clearance of six (6) inches above grade. Cover stacks with tarpaulins or other watertight coverings. Store grounds and similar small sized lumber inside the building as soon as possible after delivery.

D. Do not store seasoned lumber in wet or damp portions of the building.

E. Protect fire retardant treated materials against high humidity and moisture during storage and erection.

F. Remove delivered materials which do not conform to specified grading rules or are otherwise not suitable for installation from the job site and replace with acceptable materials.

G. All items specified in Section 087100 of this specification entitled "Finish Hardware" shall be received, accounted for, stored, and applied under this Section.

H. Hardware shall be sorted and stored in space assigned by Contractor and shall be always kept under lock and key. The safety and preservation of all items delivered will be the responsibility of the Contractor.

1.8 JOB CONDITIONS

A. Installer must examine the substrates and supporting structure and the conditions under which the carpentry work is to be installed and notify the Contractor in writing of conditions detrimental to the work. Do not proceed with the installation until unsatisfactory conditions have been corrected in a manner acceptable to the Installer and the Architect.

B. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow proper attachment of other work.

PART 2 PRODUCTS

2.1 WOOD MATERIAL

A. General
   1. All wood shall be sound, flat, straight, well-seasoned, thoroughly dry and free from all defects. Warped or twisted wood shall not be used.
   2. For miscellaneous wood blocking, grounds, furring as required, use Utility Grade Coastal Douglas Fir or Southern Pine, free from knots, shakes, rot or other defects, straight, square edges and straight grain, air seasoned with maximum moisture content

of nineteen (19) percent. Wood shall be S4S, S-Dry, complying with PS- 20.

3. Plywood and rough carpentry for telephone and electric closets, provide 3/4" thick C-D EXT-APA plywood, fire retardant treated as specified herein.

B. Wood Treatment

1. All interior wood material specified herein shall be fire retardant treated to comply with the AWPA standards (C20 for lumber, C27 for plywood) for pressure impregnation with fire retardant chemical to achieve a flame spread rating of not more than 25 (UL Class "FR-S") when tested in accordance with UL Test 723 or ASTM E 84. The fire-retardant chemicals used to treat the lumber must comply with FR-1 of AWPA Standard P17 and be free of halogens, sulfates and ammonium phosphate.
   a. After treatment, kiln dry to a moisture content of fifteen (15) percent; if wood is to be painted or finished, kiln dry to a moisture content of twelve (12) percent. Treatment shall be equal to "Dricon" made by Arch Wood Protection Inc. or approved equal. Provide UL approved identification on treated materials.
2. Treated wood which is cut or otherwise damaged shall be further treated in accordance with the AWPA Standard M-4.
3. Current Evaluation/Research Reports: Provide fire-retardant-treated wood for which a current model code evaluation/research report exists that is acceptable to authorities having jurisdiction and that evidence compliance of fire-retardant- treated wood for application indicated.
4. Interior Type A: For interior locations use fire-retardant chemical formulation that produces treated lumber and plywood with the following properties under conditions present after installation:
   a. No reduction takes place in betiding strength, stiffness arid fastener holding capacities below values published by manufacturer of chemical formulation that are based on tests by a qualified independent testing laboratory of treated wood products identical to those indicated for this Project under elevated temperature and humidity conditions simulating installed conditions.
   b. No other form of degradation occurs due to acid hydrolysis or other causes related to manufacture and treatment.
   c. No corrosion of metal fasteners results from their contact with · treated wood.
5. Products: Subject to compliance with requirements, provide one of the following:
   a. "Dricon," Hickson Corporation.
   b. "Pyro-Guard," Hoover Treated Wood Products.
   c. "FlameproofLHC-HTT," Osmose Wood Preserving Co, Inc.
   d. Or an Approved Equal.

2.2 DIMENSION LUMBER

A. Structural Framing (2't to 4" thick, 2" to 5" and wider): Provide any species and grade under WWP A or WCLIB rules which meets the following values.

1. Fb (minimum extreme fiber stress in bending); 1,400 psi.
2. Fv (minimum horizontal shear force); 90 psi.
3. E (minimum modulus of elasticity); 1,400,000

2.3 MICELLANEOUS LUMBER

A. General: Provide wood cants, nailers, blocking, furring, grounds and similar members, of sizes

and shapes shown.

B. Grade: standard Grade light framing lumber of western or southern species, and Standard Grade boards per WCLIB or WWPA rules.

2.4 CONSTRUCTION PANELS

A. Construction Panel Standards: Comply with American Plywood Association (APA) "Performance Standard and Policies for Structural-Use Panels," Form No. E445.

B. Trademark: Factory-mark each construction panel with APA trademark to show compliance with grade requirements.

C. APA Performance-Rated Panels: Provide APA Performance-Rated Panels of thickness shown and as follows:
   1. Plywood Backing Panels: For backing panels where shown, provide fire- retardant treated plywood, APA C-D PLUGGED INT with exterior glue, not less than l/2" thick.
   2. Plywood Subflooring/Underlayment Panels: For subflooring/underlayment panels where shown, provide fire-retardant treated plywood, APA RATED STURD-1- FLOOR., span rated panels, EXPOSURE I, l/2" thick, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

A. Fasteners and Anchorages: Provide size, type, material and finish complying with applicable Federal Specifications for nails, staples, screws, bolts, nuts, washers and anchoring devices.

B. Provide metal hangers, anchors and connectors of the size and type recommended by the manufacturer for each use indicated including recommended nails.
   1. Where rough carpentry work is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners and anchorages with a hot-dip zinc coating (ASTM A 153).
   2. Provide galvanized steel connectors, minimum 16 gage of type and size as recommended by manufacture for uses indicated.

C. Building Paper: ASTM D 226, Type J; asphalt saturated, non-perforated, 15-lb type.

2.6 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. [Do not use inorganic boron (SBX) for sill plates.
   2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or

otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
   1. For exposed lumber indicated to receive a stained or natural finish, omit marking and provide certificates of treatment compliance issued by inspection agency.

D. Application: Treat [items indicated on Drawings, and the following:
   1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
   3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
   4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas.
   5. Wood floor plates that are installed over concrete slabs-on-grade.

2.7 HARDWARE

A. Rough Hardware for Treated Woods and Exterior Use: Hot-dipped galvanized or Type 304 stainless steel.

B. Nails: Common steel wire, untreated for interior work as per ASTM F 1667.

C. Bolts: Standard mild steel, square head machine bolts with square nuts and malleable iron or steel plate washers or carriage bolts with square nuts and cut washers conforming to the following:
   1. Bolts: ASTM A 307, Grade A.
   2. Nuts: ASTM A 563.
   3. Lag Screws and Bolts: ASME B 18.2.1.

D. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
   1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
   2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2; use stainless steel for treated woods and exterior use.

E. Wood Screws: ASME B 18.6.1.

F. Concrete and Masonry Anchors: Standard expansion-shield self-drilling type concrete anchors where so shown or noted on the drawings, or where approved by the Architect.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where carpentry is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION GENERAL

A. Discard defective materials. Set carpentry work to required levels and lines, with members plumb and true to line and cut and fined.

B. Securely attach carpentry work as required by specified standards. Countersink nail heads on exposed carpentry work and fill holes.

C. Use fasteners of size 'to not penetrate members to exposed side or into finish materials. Make tight connections; install fasteners without splitting of wood; predrill as required.

3.3 INSTALLATION OF FINISH HARDWARE

A. All finishing hardware specified in Section 087100 of this specification entitled "Finish Hardware" shall be received, accounted for, stored and applied under this Section.

B. Hardware shall be sorted and stored in space assigned by Contractor and shall be always kept under lock and key. The safety and preservation of all items delivered will be the responsibility of the Contractor.

C. Hardware shall be carefully fitted and securely attached, in accordance with these specifications and the instructions of the various manufacturers.

D. Unless otherwise noted, mount hardware units at heights established in Section 081113.

E. Install each hardware item in compliance with the manufacturer’s instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, install each item completely and then remove and store in a secure place during the finish application. After completion of the finishes, re-install each item. Do not install surface-mounted items until finishes have been completed on the substrate.

F. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

G. Drill and countersink units which are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

H. Cut and fit threshold and floor covers to profile of door frames, with mitered corners and hair-line joints. Join units with concealed welds or concealed mechanical joints. Cut smooth openings for spindles, bolts and similar items, if any.

I. All keys used shall be construction keys which are to be tagged with fiber discs as approved, clearly labeled with identifying inscriptions and then neatly arranged in a temporary cabinet. All construction keys shall be returned to the Owner.

J. Adjusting and Cleaning
   1. Adjust and check each operating item of hardware and each door, to ensure proper operation and function of every unit. Lubricate moving parts with type lubrication recommended by manufacturer (graphite type if no other recommended). Replace units which cannot be adjusted and lubricated to operate freely and smoothly as intended for the application made.
   2. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make a final check and adjustment of all hardware items in such space or area. Clean and re-lubricate operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

3.4 INSTALLATION OF DOORS AND FRAMES

A. Preparation
   1. Remove welded-in shipping spreaders installed at factory.
   2. Prior to installation and with installation spreaders in place, adjust and securely brace standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
      a. Squareness: Plus, or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
      b. Alignment: Plus, or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
      c. Twist: Plus, or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
      d. Plumbness: Plus, or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
   3. Drill and tap doors and frames to receive non-templated mortised and surface- mounted door hardware.

B. Installation
   1. General: Provide doors and frames of sizes, thicknesses, and designs indicated. Install steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
   2. Hollow metal Frames: Set hollow metal frames at locations shown and scheduled, in perfect alignment and elevation, plumb, level, straight, true and free from rack. Brace frames to prevent displacement. Comply with provisions in SDI 105, unless otherwise indicated. Install fire rated frames according to NFPA 80.

3. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
    a. Install frames in accordance with ANSI 250.11-20001, Recommended Erection Instructions for Steel Frames, unless more stringent requirements are specified herein.
    b. At fire-protection-rated openings, install frames according to NFPA 80.
    c. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    d. Install frames with removable glazing stops located on secure side of opening.
    e. Frames set in masonry walls shall have door silencers installed in frames before grouting.
    f. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    g. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
4. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with post-installed expansion anchors.
    a. Floor anchors may be set with powder-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.
5. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames conforming to the requirements of Section 072100 – "Thermal Insulation."
6. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar; refer to Section 042000- "Unit Masonry" for installation of frames in masonry walls.
7. In-Place Concrete or Masonry Construction: Secure frames in place with post- installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
8. In-Place Gypsum Board Partitions: Secure frames in place with post-installed expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
9. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.
10. Installation Tolerances: Adjust steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
    a. Squareness: Plus, or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus, or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus, or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus, or minus 1/16 inch, measured at jambs at floor.
11. Steel Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

a. Non-Fire-Rated Standard Steel Doors:
   1. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
   2. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
   3. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
   4. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

b. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

12. Glazing: Comply with installation requirements in Division 8 Section "Glass and Glazing" and with standard steel door and frame manufacturer's written instructions.
    a. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c., and not more than 2 inches o.c. from each corner.

C. Adjustments: Check and readjust operating finish hardware items just prior to final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including doors or frames which are warped, bowed or otherwise unacceptable.

3.5 BLOCKING AND MISCELLANEOUS WOOD

A. General
1. Erect rough carpentry true to line, levels and dimensions required; squared, aligned, plumbed, and securely fastened in place.
2. Shim where required to true up furring, blocking and the like. Use wood or metal shims only.
3. Do all cutting, fitting, drilling and tapping of other work as required to secure work in place and to perform the work included herein. Do all the cutting and fitting of carpentry work, for the work of other trades as required.
4. Provide where shown for screeding or attachment of other work. Shape as shown and locate for true line and level of work to be attached.
5. Attach to support applied loading. Countersink exposed bolts and nuts flush with surfaces. Where possible, anchor to concrete and masonry during their installation.
6. Provide permanent grounds of dressed, preservative treated, key-beveled lumber not less than 1-1/2" wide and of thickness to match finish material. Remove temporary grounds when no longer required.

B. Blocking and Miscellaneous Wood
1. Furnish and install all wood grounds, furring, blocking, curbs, bucks, nailers, etc., that may be necessary and required in connection with the carpentry and with the work described for any other trades and including required carpentry for electrical fixtures. All blocking and nailers shall be continuous wherever required, whether or not so indicated.
2. Blocking shall be as required for the proper installation of the finished work and for items in mechanical sections as required. Blocking, edgings, stops, nailing strips, etc., shall be continuous, unless distinctly noted otherwise. Provide blocking as required to install all equipment. Provide blocking and nailers where shown or required to fasten interior sheet metal work.
3. Fastening for wood grounds, furring and blocking shall be of metal and of type and spacing as best suited to conditions. Hardened steel nails, expansion screws, toggle bolts, self-clinching nails, metal plugs, inserts or similar fastenings shall be used, of suitable type and size to draw the members into place and securely hold same.

3.6 TELEPHONE AND ELECTRIC EQUIPMENT MOUNTING BOARDS

A. Furnish and install 3/4" thick plywood panels to the walls of the telephone and electric equipment rooms in accordance with the requirements of the local utility company.

B. Secure to wall using proper devices for substrates encountered, spaced twelve (12) inches o.c., maximum around the edges, 1-1/2" from corners, and in three (3) rows of three (3) each in the field. Recess fastening devices flush with the plywood surface. Adjacent panels shall be butted with 1/16" space between without lapping.

3.7 INSTALLATION OF CONSTRUCTION PANELS

A. General: Comply with applicable recommendations contained in Form No. E 30F, "APA Design/Construction Guide-Residential & Commercial"

B. Fastening Methods: Fasten panels as indicated below:
   1. Plywood Backing Panels: Nail or screw to supports.
   2. Subflooring/Underlayment Panels: Glue-nail to framing. Continually glue and nail, 6" o.c. on panel edges and 8" o.c. over intermediate framing.

3.8 TEMPORARY EXTERIOR HANDICAP RAMP

A. Ramp: Temporary exterior handicap ramp shall be constructed with pressure treated (PT) structural wood members, 3/4" thick exteriors grade plywood and all necessary hardware, anchors and/ or fasteners, finishes and accessories for a complete installation. Ramp shall include all framing, railings, landings and curbs.

B. Regulatory: Ramp shall comply with Building Code and ADA guidelines.

C. Signage: The Contractor will also be responsible for temporary signage (weather resistant) to redirect public. Signage material, size, lettering, and quantity shall be appropriate for the scope and scale of the work and securely attached or posted (minimum: 2 Signs, 24" x 24" each).

D. Submittals: Provide shop drawings for ramp (anchoring, framing, and railing, elevations and slopes, etc) and signage, prior approval required by Architect or the RE/PM before construction is to begin.

E. Demolition: The Contractor is also responsible for the removal and cleanup of any temporary ramp installed during the project. Therefore, the demolition, removal, associated patching and cleanup of the temporary exterior ramp and related signage shall be deemed included in the Unit Price, at no additional cost to the City.

3.9 ROUGH HARDWARE

A. Securely fasten rough carpentry together. Nail, spike, lag screw or bolt as required by conditions

encountered in the field and the Contract Documents.

B. Provide rough or framing hardware, such as nails, screws, bolts, anchors, hangers, clips, inserts, miscellaneous fastenings, and similar items of the best quality and of the proper size and kind to adequately secure the work together and in place, in a rigid and substantial manner.

C. Secure rough carpentry to masonry with countersunk bolts in expansion sleeves or other acceptable manner, with fastenings not more than sixteen (16) inches apart. Secure woodwork to hollow masonry with toggle bolts spaced not more than sixteen (16) inches apart.

D. Countersink bolts in nailers and other rough woodwork and include washers and nuts. Cut bolts off flush with surfaces and peen as may be required to receive finished work.

E. Inserts to secure wood nailers to concrete shall be malleable iron threaded inserts with 3/8" diameter bolts of length to allow for countersinking. Locate at end of each nailer and at intervals not exceeding thirty (30) inches o.c.

F. Furnish to the mason for building into the work, or attaching the work which is to be built in, anchors, bolts, wall plates bolted to masonry, corrugated wall plugs, nailing blocks, etc., which are required for the proper fastening and installation for the work or other items as called for in this Section.

G. Detailed instructions with sketches of necessary requirements, shall be given to the masonry trade showing the location and other details of such nailing devices.

3.10 CLEANING UP

A. General: Keep the premises in a neat, safe and orderly condition at all times during execution of this portion of the work, free from accumulation of sawdust, cut ends and debris.

B. Sweeping
   1. At the end of each working day, or more often if necessary, thoroughly sweep all surfaces where refuse from this portion of the work has settled.
   2. Remove the refuse to the area of the job site set aside for its storage.
   3. Upon completion of this portion of the work, thoroughly broom clean all surfaces.

END OF SECTION 061000

SECTION 062000
MILLWORK

PART – 1 GENERAL

1.1 SUMMARY

A. Work Included: Provide mill work in accordance with the Contract Documents. The Contract Documents are as defined in the Agreement. The General Conditions governing all contracts shall apply to all work under the Contract. The Work of this Section includes the furnishing of all labor, material, equipment etc. necessary for the fabrication, delivery and installation of millwork, finish carpentry and interior architectural woodwork as shown on the drawings provided, specified herein, or as required and/ or directed by the Architect or DCAS. The Work of this Section shall include but not be limited to the following:

1. Casework, cabinets, countertops, and shelving.
2. Miscellaneous trim and base work.
3. Cabinet hardware and adjustable shelf hardware.
4. Radiator Enclosures.
5. Wood and Metal Access Panel.
6. Courtroom Woodwork (Includes Landmark and/ or Landmark Quality): Judge's bench, witness stand with railing, stenographer station with railing, jury box with railing, jury box decorative paneled partition (with molding, top, end and base trim) and railing (solid paneled construction or balustrade, including gate and hardware).
7. All other items of finish carpentry work as required or as directed by the Architect or DCAS.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 061000 Rough Carpentry.
2. Section 064010 Architectural Woodwork Restoration.
3. Section 099100 Painting.
4. Section 096519 Resilient Tile.

1.2 DEFINITIONS

A. MDF: Medium-density fiberboard.

B. MDO: Plywood with a medium density overlay on the face.

1.3 SUBMITTALS

A. Product Data for each type of factory-fabricated product and process specified, including details of construction relative to materials, dimensions of individual components, profiles, textures, and colors.

B. Wood treatment data as follows, including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated material:

1. For fire-retardant-treated wood products include certification by treating plant that treated materials comply with specified standard and other requirements.

2. Include data for wood-preservative treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
3. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.

C. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
1. Show details full size.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking, and reinforcing specified in other Sections.
3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, and other items installed in architectural woodwork.
4. Show veneer leaves with dimensions, grain direction, exposed face, and an identification number indicated for each leaf.
5. Courtroom Woodwork: The description of the courtroom woodwork is general in nature and the Contractor shall refer to all details on the drawings to he provided and shall submit three (3) sets of shop drawings for approval before fabrication and installation.

D. Samples for initial selection of the following in the form of manufacturer's color charts consisting of actual units or sections of units showing the lull range of colors, textures, and patterns available of each type of material indicated.
1. Each type of trim specified. 12" long samples.
2. Plastic laminate, 3 samples. 12" square, for each type, color, and surface finish.
3. Exposed hardware, one unit of each type and finish.
4. Cabinet door and hardware before construction.
5. Courtroom Woodwork: Finish paneling (12 x 12" sample), oak cap or balustrade profile for replacement-in-kind (12" long sample) as directed by the Architect or DCAS for approval, before fabrication and installation.
6. Granite, finish polished, minimum sample size 4" x 4" x 3/8" thick.

E. Material test reports from a qualified independent testing agency indicating and interpreting test results relative to compliance of fire-retardant-treated wood products with requirements indicated.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: All work shall be performed by skilled workers. The Contractor or sub-contractor performing the work of this section must have recently completed finish carpentry work similar in cost, material, design, and extent to that indicated by this section, and whose work has resulted in construction with a record of successful in-service performance.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver interior finish carpentry until environmental conditions meet requirements specified for installation areas. If finish carpentry must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

C. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

D. Deliverinterior finish carpentry materials only when environmental conditions comply with requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions comply with requirements specified for installation areas.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install interior finish carpentry until building is enclosed and weatherproof, wet-work in space is completed and nominally dry, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels through the remainder of construction period.

B. Maintain temperature and humidity in installation area as required to maintain moisture content of installed woodwork within a 1.0 percent tolerance of optimum moisture content, form date of installation through remainder of construction period. Require Woodwork Manufacturer to establish optimum moisture content and required temperature and humidity conditions.

1.7 RELATED DOCUMENTS

A. Drawings, details and/ or plans by the Design Consultant, or Architect of the various courtroom locations will be supplied by DCAS as they become available.

PART – 2 PRODUCTS

2.1 MANUFACTURER

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high pressure decorative laminates or granite which may be incorporated in the work include; but are not limited to, the following:
   1. Formica Corp.
   2. Nevamar Corp.
   3. Ralph Wilson Plastics Co.
   4. Chemcore Industries Inc.
   5. Or an Approved Equal.

2.2 MATERIALS, GENERAL

A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," for lumber and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee Board of Review.

B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:
   1. NELMA- Northeastern Lumber Manufacturers Association.
   2. NHLA- National Hardwood Lumber Association.
   3. NLGA- National Lumber Grades Authority.
   4. SCMA- Southern Cypress Manufacturers Association.
   5. SPIB- Southern Pine Inspection Bureau.
   6. WCLIB- West Coast Lumber Inspection Bureau.
   7. WWPA- Western Wood Products Association.

C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
   1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece, or omit grade stamps entirely and provide certificates of grade compliance issued by inspection agency.

D. Softwood Plywood: Comply with DOC PS 1, "U.S. Product Standard for Construction and Industrial Plywood."

E. Hardwood Plywood: Comply with HPVA HP-1, "Interim Voluntary Standard for Hardwood and*Decorative Plywood."

F. Hardboard: ANSI/AHA A 135.4

G. Medium-Density Fiberboard: Product made without formaldehyde and complying with ANSI A208.2, Product Class MD.

H. Product: Subject to compliance with requirements, provide "Medite D" by Medite Corp; or an Approved Equal.

I. Particleboard: ANSI A208.1, Grade M-2.

J. High Pressure Laminate: NEMA LD 3.

K. Granite: Comply with ASTM C97, C99, CI70, C241, C880.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Use materials impregnated with fire-retardant chemical formulations indicated by a pressure process or other means acceptable to authorities having jurisdiction to produce products with fire-test-response characteristics specified. Comply with New York City Building Code requirements.

B. Fire-Retardant Chemicals: Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.

C. Fire-Retardant-Treated Lumber Comply with the following:
   1. Low-Hygroscopic Formulation: Interior Type A per AWPA C20.
   2. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.
   3. Discard treated material that does not comply with requirements of referenced standards. Do' not use twisted, warped, bowed, discolored, or otherwise damaged or defective material.
   4. Available Products: Subject to compliance with requirements, products that may incorporate in the Work include, but are not limited to, the following:
      a. Low-Hygroscopic Formulation (Type A):
         1. D-Blaze; Baxter: J. H. Baxter Co.
         2. D-Blaze; Chemical Specialties, Inc.
         3. Pyro-guard; Continental Wood Preservers, Inc.
         4. Dricon; Hickson Corp.
         5. Pyro-guard; Hoover Treated Wood Products, Inc.;
         6. Or an Approved Equal.

2.4 BASIC MATERIALS AND FABRICATION METHODS

A. General: Except as otherwise indicated, comply with following requirements for Premium Grade as defined by AWI for millwork items specified.

B. Wood Moisture Content Provide kiln-dried (KD) lumber with an average moisture content range of 6% to 11% for interior work. Maintain temperature and relative humidity during fabrication, storage and finishing operations so that moisture content values for woodwork at time of installation does not exceed 5% to 10%.

C. Fabricate woodwork to dimensions, profiles, and details indicated with openings and mortises precut, where possible, to receive hardware and other items of work.
   1. Ease edges to a 1/16" radius, for edges of solid wood (lumber) members less than 1" in nominal thickness, 1/8" radius for edges of rails and similar members over 1" in nominal thickness.

D. Complete fabrication, assembly, finishing, hardware application, and other work before shipment to maximum extent possible. Disassemble components only as necessary for shipment and installation.

E. Where necessary, provide ample allowance for scribing, trimming, and fitting.

F. Pre-Cut Openings: Provide woodwork with pre-cut openings, where possible, for hardware, appliances, plumbing fixtures, electrical work; telephone, cut-outs, and similar items. Locate openings accurately and provide proper size and shape. Smooth edges of cutouts and, where located in countertops, seal edges of cutouts with a water-resistant coating.

G. Measurements: Before fabrication of Woodwork to be fitted to other construction, obtain field measurements, and verify dimensions and shop drawing details as required for accurate fit.
   1. Where field measurements before fabrication would delay the project, fabricate without field measurements, and provide ample borders and edges to allow scribing and trimming of woodwork.

H. Solid Wood: AWI Section 100, Grade 1, and as follows:
   1. Opaque Finish: Premium quality medium density fiberboard.
   2. Transparent Finish: Premium quality AWI TR-2.
   3. Concealed: Any hardwood specie. Grade 01 per AWI Section 100.

I. Plywood: Veneer core, minimum 3/4" thick unless otherwise noted, interior grade using exterior type waterproof glue.
   1. Provide "A" face plies of 1/26" plain sliced, clear, paint grade for exposed and semi-exposed surfaces to receive "painted" finish.
   2. Provide plywood for "painted" finish with "V" type hardwood edge banding on exposed edges and on all edges of adjustable shelves. Edge band shall be tongued, and pressure glued core with mitered comers.

J. Panel Products: AWI Section 200, particleboard core plywood, with face veneers matched as indicated.
   1. Opaque Finish: Premium grade medium density fiberboard which will not show any defects when finished with specified opaque finish.
   2. Transparent Finish: Premium quality AWI TR-2.
   3. Plastic Laminate: Comply with NEMA LD-3-for Grade GP-50; 0.050” thickness of color, pattern and finish. Refer to schedule at end of Section.

K. Lumber: AWI Section 100 with the following requirements:
   1. Hardwood for Concealed Blocking and Framing: Economy grade, any species which when painted, will not show any defects.

L. Particleboard: AWI Section 200, particleboard core unless otherwise indicated, with the following requirements:
   1. Use particle cores of "Duraflake FR'\ as manufactured by Willamette Industries, Inc.; or an Approved Equal
   2. Provide facings and edgings as indicated.

M. Courtroom Woodwork (Material):
   1. All exposed wood shall be oak of the best grade of its respective kind suitable for the particular purpose intended. It shall be well seasoned, kiln dried, free from shakes, large or loose knots and all imperfections which might impair its strength,
   2. durability or appearance.
   3. All lumber for framing shall be No. 1 Dimension Douglas Fir No. 1 or Southern Pine. All framing members shall be of sizes shown on plans.
   4. Furnish and install wall wood grounds, furring, blocking, sleepers, nailers, etc. that may be necessary, required per drawings or as directed by the Project Manager.
   5. Fastening for wood grounds, furring, blocking, etc. shall be metal and of the type and spacing best suited to the conditions.

N. Granite Countertop:
   1. Adhere to the standards of ASTM and GSA for compressive strength, absorption by weight, density, abrasive resistance, etc.
   2. Edge treatments will be eased or bullnosed. Thickness to be 1". Color, variegation and grain for countertop to be specified by Architect. If granite slabs to be joined, variegation and grain must be continuous and well-matched.
   3. Mechanical fastener and adhesive anchoring products and techniques be specified by Architect.

O. Architectural Grille:
   1. Radiator grille #Agio-B by Architectural Grille or approved equal. Aluminum with satin finish. Contractor to provide shop drawings to architect for approval prior to fabrication.

2.5 INTERIOR STANDING AND RUNNING TRIM

A. Hardwood Trim: Provide finished hardwood lumber and moldings complying with the following requirements:
   1. Species: Gear, kiln-dried white hardwoods.
   2. Texture: Surfaced (smooth).
   3. Lumber for Transparent Finish (Stained or Clear): Solid lumber stock.

2.6 MISCELLANEOUS MATERIALS

A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
   1. Where finish carpentry materials are exposed in areas of high humidity. provide fasteners and anchorages with hot-dip galvanized coating complying with ASTM A 153.

B. Fasteners:
   1. Wood Screws: FS FF-S-111, type, size, material and finish as required for the condition of use.
   2. Nails: FS FF-N-105, type, size, material and finish as required for the condition of use.
   3. Anchors: Type, size, material and finish as required for the condition of use
   4. Staples: Type, size, to provide sufficient strength to hold upholstered fabric taut and in place without sagging.
   5. Panel Supports: Provide wood veneer panel supports where indicated.

C. Adhesives
   1. For Laminating Plastic Laminate Surfaces: Melamine, phenol-resin, or resorcinol-resin complying with FS MMM-A-181; type, grade, and class best suited for the purpose.
   2. For All. Other Uses: Moisture resistant complying with FS MMM-A-125, Type II, or MMM-A-188, Type I, II or III; type best suited for the purpose.
   3. All adhesives shall meet (MSDS) Material Safety Data Sheet Standards.

D. Grommets: Provide diameters shown; satin finished chrome grommet sleeves sizes as indicated on drawings.

E. Glue: Aliphatic- or phenolic-resin wood glue recommended by manufacturer for general carpentry use.

2.7 FABRICATION- GENERAL

A. General: Provide architectural woodwork visible from any one space or room fabricated from a single flitch obtained from the same tree, and shall match in cut grain, color, finish, and other aesthetic effects.
   1. All woodwork for a given floor to be selected from the same flitch obtained from a single tree.

B. Provide steel framing and lumber framing for architectural woodwork, complete with all bracing and fastening devices as required for a rigid installation, and as required to sustain the imposed loads.

C. Do all fabrication from field measurement with provision for scribing as required to meet built-in conditions.

D. Coordinate the work of this Section with the work of other trades.

E. Fabricate units in largest practicable sections. Trial fit in the shop, disassemble for shipment and reassemble with concealed fasteners.

F. Fabricate architectural woodwork from specified veneers, all sapwood and other imperfections shall be clipped out. Each elevation of specified woodwork shall be of a single flitch. Each item of woodwork for this project shall be fabricated of veneers, from a singletree.

G. Maintain relative humidity and temperature during fabrication, storage and finishing operations matching that of the areas of installation.

H. Details indicate me required type of construction. Modifications to conform to manufacturer's standards will be considered providing they comply with the Contract Documents, maintain the profiles shown and subject to acceptance by DCAS.

I. Reinforcing shown is minimum. Provide additional reinforcing as required toensure a rigid assembly. Exposed surfaces shall be free from dents, tool marks, warpage buckle, glue and open joints, or other defects. Accurately fit all joints, comers, and miters.

J. Provide openings for hardware, appliances, plumbing fixtures, and electrical work.

K. Locate openings accurately and use templates or diagrams for proper size and shape. Smooth edges of cutoffs and seal edges of cutouts in countertops with a water-resistant coating.

L. Provide balancing sheets as required, and specified, complying with referenced AW1 standards.

M. Courtroom Woodwork (Fabrication, General):
   1. Faces shall be of one or more pieces of veneer matched for color and grain at the joints to produce continuity of character and balanced design. Faces shall be free of open joints, face depressions, glue stains or other manufacturing defects. Faces shall not contain ruptured grain, doze or shakes.
   2. All wood finish shall be accurately milled to detail with clean cut molding, profiles and

lines, machined, sanded perfectly smooth, be housed joined blocked, put together in the best manner, with provisions for swelling, splitting or opening of joints.

3. The finished woodwork in so far as practicable and as construction conditions permit shall be assembled, finished and carefully pre-fitted at the shop and delivered to the site in complete units ready to set in place and shall be able to fit through a 3M)" X 7MT door opening.
4. Jury Box platform, Judge's Bench and Witness Stand shall be as shown and called for in the plan and shall be complete with wood faced railings, caps, molding, trim etc.
5. Railing shall be complete (including swinging gates and matching hardware) with all necessary supports and anchors as detailed on the drawings. Any and all members and components necessary for a complete assembly and installation will be required (including the replacement-in-kind of balustrade profiles).

N. SHELVING

1. Storage Closet
   a. Provide (5) ¾" thick and 15" deep (min.) plywood shelves with hardwood edges mounted on standards and brackets, where indicated on plan. Provide additional blocking. Finish to be specified by consultant and approved by DCAS and agency.
2. Coat Closet
   a. Provide (1) ¾" thick by 14" deep particle board shelf with plastic-laminate plywood shelf with hardwood edge. Provide side and back supports. Provide 11/4" diameter, polished chrome tube, heavy duty hang rod or equivalent as specified by consultant and approved by DCAS and agency.
3. Open Shelving
   a. Provide shelving as indicated on approved plan.

O. CABINETS- (At pantries, laboratories, as per program requirements, including pigeonhole millwork in mailrooms, etc.).

1. Provide cabinets as indicated per the approved preliminary plan. Landlord's consultant architect to provide sections and details of all cabinets shown on approved construction documents. Provide min. ¾" plywood board with specified veneer. Provide nosing, grommets, backsplash, supports and bracing.

**Note: Add ADA cabinet hardware.

P. COUNTERS- (At reception areas, pantry, information desk areas, waiting areas, etc.).

1. Provide Eco-Friendly countertop made from composite and recycled material from the following Manufacturers:
   a. Hanstone
   b. Richlite
   c. IceStone
   d. Vetrazzo
   e. Caesarstone
   f. Silesstone
   g. EnviroGlas
   h. Paperstone

i. Squak Mountain Stone
j. Eco Top
k. WilsonArt (Laminate)
l. Mid-Atlantic (Laminate)
m. Or an Approved Equal by DCAS architect or engineer.

2. Landlord's Architect to provide sections and details of all counters shown on approved construction documents. Provide min. ¾" plywood board backing. Provide nosing, grommets, backsplash (for wet areas), supports and bracing as required.

**Note: differentiate wet, heavy use and customer facing counters (solid surface) vs back of house- copy areas and other plan uses.

Q. MISCELLANEOUS COUNTERS- (At Equipment and Work Area, and as shown throughout the floors.)

1. Landlord's Tenant Work Architect to provide sections and details of all counters (shown on approved drawings). Provide 3/4" plywood counters with plastic laminate finish to be selected by Landlord's Tenant Work Architect and approved by DCAS Architect and Agency. Provide nosing, grommets, supports and bracing, drawers and open storage bins as required.

2.8 CABINET HARDWARE

A. Schedule of acceptable cabinet hardware: Or an Approved Equal.

1. Drawer glides: "Grant"; Model #328 (up to 50 lbs.): #329 (over SO lbs.).
2. Back-mounted hinges: "Stanley"; Series #1560, size to suit.
3. Shelf supports: "Grass" of America.
4. Magnetic catches: "Ives"; Series #323/per leaf. 5.-
   Shelf pins and ferrules: "Grass"; stainless steel.

B. Provide model, size as required for me proper installation.

2.9 FACTORY FINISHING OF INTERIOR ARCHITECTURAL WOODWORK

A. Quality Standard: Comply with AWI Section 1500 unless otherwise indicated.

B. General: The entire finish of interior architectural woodwork is specified in this section, regardless of whether factory applied or field applied touch-up after installation.

C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces and similar preparations for finishing of architectural woodwork, as applicable to each unit of work.

D. Transparent Finish: Comply with the requirements of the City of New York EPP.

E. Minimum Standards for Construction Products (clear wood coating) as indicated below for grade, finish system, color, effect and sheen:

1. Grade: Premium.
2. AWI Finish System: TR-2- Catalyzed Lacquer.

3. Stain and Effect Natural satin luster appearance.
4. Sheen: Semi-gloss.

C. Opaque Finish: Comply with requirements indicated below for grade, finish system, color, effect and sheen:
1. Grade: Premium.
2. AWI Finish System: OP-2- Catalyzed Lacquer.
3. Color and Effect: As selected by Architect.
4. Sheen: Natural satin luster appearance.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting installation and performance of finish carpentry. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Courtroom Woodwork: Installer must examine the areas and conditions under which the courtroom woodwork will be installed. Notify DCAS in writing of the conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 SCHEDULING

A. The Contractor shall begin diligently to fabricate all the above millwork and as each of the various courtroom spaces become available, The Contractor shall be notified to begin installation of his work at such premises.

B. The Contractor shall complete all of his fabrication and installation without the various premises interfering with the courtroom activity.

C. Electrical work will be done by others, but the Contractor shall cooperate with such parties so that the work can be completed within the allowed contract time.

3.3 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Condition finish carpentry to average prevailing humidity conditions in installation areas before installation, for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

C. Prime and back-prime lumber for painted finish exposed on the exterior. Comply with requirements for surface preparation and application in Division 9 Section "Painting."

3.4 INSTALLATION, GENERAL

A. Do not use finish carpentry materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
   1. Do not use manufactured units with defective surfaces, sizes, or patterns.

B. Install finish carpentry plumb, level, true, and aligned with adjacent materials. Use concealed shims where required for alignment.
   1. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
   2. Countersink nails, fill surface flush, and sand where face nailing is unavoidable.
   3. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) for plumb and level.
   4. Install adjoining finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
   5. Coordinate finish carpentry with materials and systems in or adjacent to standing and running trim and rails. Provide cutouts for mechanical and electrical items that penetrate exposed surfaces of trim and rails.

C. Finish according to specified requirements.

D. Refer to Division 9 Sections for final finishing of finish carpentry.

3.5 JUDGE'S BENCH DESK- COURTROOM WOODWORK

A. Unless otherwise specified or shown, all cabinet work shall be constructed of thick oak veneered plywood panels as manufactured by the US Plywood Corporation or approved equal, and shall be complete with all blocking, framing, supports, brackets, etc. for a complete assembly. All cut edges of veneered plywood are to be finished with iron on wood grain tape matching the veneer grain to color.

B. Unless otherwise specified or shown, drawers shall be constructed with 1-1/2" thick solid fronts, 3/4th sides, and backs, and all four comers shall be detailed. Backs, fronts and sides shall be fitted with tubular metal pull, bronze finish. Drawers shall be operated on wood slides and shall be furnished with bronze pin tumbler cylinder locks. Furnish three (3) keys.

C. Desktop shall be 3/4th thick oak veneered plywood with solid wood edging and molding.

D. Allwork shall be carefully assembled and fastened together to provide secure and true construction. All fastening shall be concealed in the finish work. The work is to be off- site in largest possible sections but must be able to be broken down for delivery through mm. 3’ X 7’ door opening.

E. All finished work shall be erected plumb and true and in accordance with the best methods known to the cabinet maker’s trade. Surfaces shall be true and free from all machine and tool markings, bruises, indentation, chips or abrasions.

F. All finished work shall be properly installed and otherwise substantially fastened, in place as best suited for each condition and as needed to permanently hold it to correct lines and levels.

G. The exterior and interior sides of the Judge's Bench (also for Witness Stand and Jury Box) to receive a 6"

high solid oak base. Court railings to receive a 6" high oak wood base as detailed on drawing. However, new base on above woodwork to match existing shall take precedence over previously mentioned base.

3.6 WOOD FINISHES- COURTROOM WOODWORK

A. Panels shall be finished with four (4) coat conversion lacquer system consisting of sealer, combination filler-stain and two (2) separate coats of final finish.

B. Sealer coat to be compatible with final coats specified. Sealer shall be applied by spray or roller, thoroughly dried to a solid film and then lightly sanded. Combination filler-stain to be sprayed or rolled on and fully padded into surface and wiped off. Final finish to consist of two (2) coats of clear, durable catalyzed conversion lacquer.

C. Wood splines and cornice trim shall be factory finished in black enamel satin finishes, or as specified and/ or as directed.

D. All courtroom woodwork shall be finished. The finishing of all courtroom woodwork shall be deemed included in the Unit Price.

3.7 RAILING AND GATE HARDWARE- COURTROOM WOODWORK

A. Courtroom Railing: Courtroom railing shall include panelwork construction with oak veneer plywood, solid oak trim, base and cap, or solid oak balustrade railing to match and/ or replace in kind (includes Landmark and/ or Landmark Quality) or as directed by the, Architect and/ or DCAS. All oak shall be premium quality.

B. Hardware: Gate hardware shall be double acting spring gate hinges of sizes and weight required for weight of the wood gate (minimum of 2 per gate). Hinges shall be as manufactured by Bommer (USI OB finish); or an Approved Equal.

3.8 STANDING AND RUNNING TRIM INSTALLATION

A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches (610 mm) long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at comers to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints, if required.
   1. Match color and grain pattern across joints.
   2. Install trim after gypsum board joint finishing operations are completed.
   3. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

3.9 RADIATOR ENCLOSURES

A. Radiator enclosures shall be custom built and fabricated to suit existing job site conditions and dimensions.

The enclosures shall be constructed the full length or part thereof as specified or as indicated on the drawings provided by the Architect or DCAS.

B. Enclosure unit shall be constructed from 3/4" oak veneer plywood with interior lining of # 14 gauge cold-rolled stretcher level zinc-coated steel sheet unless otherwise directed by the Architect.

C. The radiator enclosure shall be fully detachable for complete access to radiator. Removable unit parts shall be easy to remove and unlock, to pull out and re-lock by screw or slide-in back method, and which shall be completely rattle-proof to touch or to die air pressure of the radiator.

D. Top cover shall be reinforced sufficiently to support its own load as well as other loads expected for a countertop to hold. Unit shall be provided with a defection plate or support, carried through the full length of the enclosure.

E. Top cover shall have cutout to receive decorative discharge grille with border, aluminum with satin finish approximate 4" x 30" stock size or as shown on plans/drawings.

F. The radiator enclosure shall have swingout doors, provided with decorative, discharge grille as specified or shown on drawing.

G. Between operable door cabinets and metal radiator enclosure, the Contractor shall provide infill units of the same finish materials and dimensions as cabinets (false fronts) forming a flush surface, with the adjacent, as specified or shown on drawing.

H. The Contractor shall submit shop drawings for any variations from the detail shown on any and all drawings for Architect's approval.

3.10 SHELVING

A. Shelves shall be constructed of 3/4" thick oak veneered plywood, unless otherwise specified. Plywood shall be free from knots, cracks, blemishes, etc. and sanded smooth.

B. Wood finish shall be one (1) coat of stain and two (2) coats of polyurethane. Color of stain shall be selected by Architect Approval of stain, or an Approved Equal, will be required before application.

C. All cut edges are to be finished with iron-on wood grain tape to match wood veneer or with 1/4" thick solid K.D. strip on all edges.

3.11 COUNTERS AND COUNTERTOPS

A. All woodwork shall be carefully cut arid constructed throughout to conform with finished dimensions as shown in drawings to be provided keeping with the best practice of the trade. Work shall be pre-assembled as far as practical. No work shall be installed until surface is cleaned, leveled and fully prepared.

B. Lumber and plywood used for construction shall be fire retardant treated. Affidavits attesting to this shall be submitted for each type.

C. All woodwork comer joints shall be blind mitered, dovetail connected. Nailing and gluing shall be neat sufficient and invisible wherever possible and shall result in a rigid and squeak- free construction. All cut edges are to be finished with iron-on woodgrain tape to match wood veneer.

D. All lumber and plywood shall be straight, true and level, free of warpage, splitting, serious cracking, knots and other defects affecting the strength and appearance. Lumber shall be construction grade 1 (1400 lbs. Fiber stress to be grade and trade marked). All exposed lumber and plywood shall be oak wood and shall be kiln dried. Counters shall be constructed of 3/4" architectural grade plywood. Drawers shall be constructed from 1/2" oak veneer plywood, provided with drawer slide hardware for easy putting and return, and any and all hardware and fastenings as required and necessary.

E. Counter shall be provided with drawer units and shelves as shown on the drawings and specified herein. Drawers and shelves shall be square and true, sanded and prepared ready for varnish.

F. Countertop should be prepared to receive 1" granite as indicated following manufacturer's recommendations.

G. Granite countertop will be vanity mounted or wall hung on full perimeter steel support angles and will include all cutouts required. For every 30" of width, contractor shall provide a minimum of one (1) sink cutout to accept all related faucets and accessories.

3.12 CABINETS

A. Cabinets shall be installed in locations shown on the plan and required to fit flush with- line of window wall cabinetry. Cabinets shall be pairs of double door cabinets, of approximate finish dimensions 24" deep exterior and a height of 30" or up to the height of the finished windowsill.

B. Cabinets shall sit on a board of continuous 2" X 4" lumber, forming a 4" high toe space covered in vinyl base molding and topped with oak trim.

C. Cabinets shall have a top counter of oak veneer plywood finish as selected and vertical surfaces shall be covered in hardwood veneer paneling as described in the drawing. All cabinets shall be edged in oak trim as described.

D. Doors shall be of oak plywood with solid edge throughout Doors shall be hung on one pair of fully concealed self-closing cabinet door hinges, so that doors fully overlap frames and no interior color or edge is visible when closed. Doors when open shall hold back against cabinets without damaging any woodwork or hardware.

E. Cabinets shall contain one 5/8" thick shelf covered on all sides with the same interior color of birch plywood. Shelf shall be easily adjustable on metal clips fitting into pre-coaled slotted standards painted to match interior finish, or approved fastening.

F. Doors shall be fitted with built-in handgrab, allowing an open area for grabbing of at least 1" deep and 3-1/2" long. Doors shall be fitted with interval positive fastening devices top and bottom and an approved pin tumbler cylinder lock, with bolt throw sufficient for easy and secure locking of each pair

of doors. The Contractor shall supply four keys for each pair of cabinets (4 doors) to be keyed alike: The Contractor shall submit one complete door with hardware for approval before proceeding with construction.

3.13 ALL PURPOSE ACCESS PANEL

A. The Contractor shall furnish and install an all-purpose access panel minimum size approximately 24" X 30" for use in plastered, masonry, drywall, and certain ceiling surfaces. Exact dimension shall be in accordance with the site condition and as provided by the Architect.

B. The all-purpose access panel shall provide convenient access for inspection or services to vital components or utility services. Panel material shall be as directed by the Architect or DCAS and in accordance with specifications.

3.14 WOOD ACCESS PANEL

A. Wood access panel shall have a frame of oak,' kiln dried solid lumber and panel lover of 1'* thick veneer plywood with solid oak edge trims. Hinge shall be of concealed continuous stainless steel. Latch shall be flush mounted key lock or tamper resistant latch. Finish shall be one (1) coat of stain and two (2) coats of polyurethane unless otherwise specified by the Architect or DCAS.

3.15 METAL ACCESS PANEL

A. Metal access panel shall have frame of 060-6063 T6 extruded aluminum and panel comer of 0.060 aluminum as manufactured by "CESCO Products" Or Approved Equal. Hinge shall be concealed continuous stainless steel. Latch shall be flush mounted key lock or tamper resistant latch. Finish shall be galvanized steel/mill.

3.16 ADJUSTING

A. Repair damaged or defective finish carpentry where possible to eliminate functional or ' visual defects. Where not possible to repair, replace finish carpentry. Adjust joinery for uniform appearance.

B. Replace interior finish carpentry that is damaged or does not comply with requirements. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.17 CLEANING

A. Clean interior finish carpentry on exposed and semi exposed surfaces. Restore damaged or soiled areas and touch up factory-applied finishes if any.

3.18 PROTECTION

A. Provide final protection and maintain conditions that ensure finish carpentry is without damage or deterioration at the time of Substantial Completion.

B. Protect installed products from damage from weather and other causes during construction.

C. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
   1. Indications that materials are wet, or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

3.19 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

END OF SECTION 062000

SECTION 064010
ARCHITECTURAL WOODWORK RESTORATION

PART 1 – GENERAL

1.1 SUMMARY

A. Work included: Provide architectural woodwork restoration in accordance with the Contract Documents. The Work of this Section shall include but not be limited to the following:

1. General: Restored woodwork shall include all wood components as indicated on the drawings both to be restored or altered, or to remain.
2. Install protection of all woodwork scheduled to remain during demolition and construction.
3. Salvage sufficient pieces of each type of woodwork to serve as models for new woodwork noted on the drawings to match existing.
4. Make necessary alterations to woodwork to remain to interface with new construction.
5. Restore all wainscoting, balustrades, moldings and paneling as indicated on drawings to remain, including insertions of Dutchmen, filling, and preparing surfaces to receive new finishes.
6. Fabricate and install new woodwork where modifications must be made to the existing woodwork to accommodate new construction.
7. Refinish woodwork where indicated. Removal of existing finish, except shellac, is to be performed under Section 099101.

B. Related Work of Other Sections: The following related work is to be performed by other trades under the designated sections:

1. Division 2 “Demolition and Removal of Selected Portions of Building and Site Elements” – Section 024119
2. Division 6 “Rough Carpentry”- Section 061000
3. Division 6 “Interior Architectural Woodwork” – Section 064023
4. Division 8 “Door Hardware”- Section 087100
5. Division 9 “Stone Flooring”- Section 096340
6. Division 9 “Painting”- 099100
7. Division 9 “Paint Removal” – Section 099101

C. Definitions:

1. Restoration as defined herein shall mean the treatment of new and existing architectural components, to recreate or rehabilitate the original appearance, including the molding profiles, dimensions and finishes, except where noted on the drawings and specifications. Restoration shall also include additions and filler panels to complete the approved new design.
2. Protection as defined herein shall include all means necessary to protect salvaged elements during demolition, construction, artifact removal, shipping storage and reinstallation. Protection insures all materials and surfaces from damage of any kind.
3. Documentation as defined herein shall include all means necessary to provide adequate

information about salvaged and removed elements such that they can be re-assembled, re-fitted, re-installed as per restoration standards. This shall include taggings, photography, numbering, recording information on drawings and making available all documentation to DCAS at any time during work. Documentation includes clearly labeled and tagged crates, bags, wrappings, or other means of protective covering.

4. Salvage as defined herein shall include all artifacts designated to be documented, removed, stored, protected, restored and re-installed.
5. Artifact as defined herein is an architectural object or element such as a door or panel,
6. either a part of or the entire object.

1.2 QUALITY ASSURANCE

A. The Contractor or subcontractor performing the Work of this Section, must during the last five (5) years prior to bid opening, as a prime contractor or subcontractor have successfully completed in a timely fashion at least two (2) projects similar in scope, materials, and extent to the required work in this Contract (i.e. architectural woodwork restoration on buildings that are considered landmark, landmark quality or buildings of equivalent historical or architectural significance).

B. The exterior of the buildings has been designated as "Landmarks" by the Landmarks Preservation Commission of the City of New York and the interior of the building is historically significant and as such, the Contractor must take every precaution to protect surfaces and finishes that are to remain.

C. Source of Materials: Obtain materials for architectural woodwork restoration from a single source for each type of material required to ensure a match in quality, color, and texture.

D. Timely Notification: Contractor shall notify DCAS before beginning work. Obtain DCAS's approval of the reinstallation of dismantled wood paneling sections, before proceeding with the work.

E. Materials shall conform to the latest edition of reference specifications applicable and specified herein and to applicable codes and requirements of local authorities having jurisdiction.
   1. Materials shall conform to governing regulations regarding the content of volatile organic compounds (VOC).
   2. Finishing materials and work shall conform to the Painting and Decorating Contractors of America (PDCA).
   3. The Contractor shall comply with relevant ASTM Standards for all materials.
   4. All work shall comply with the United States Secretary of the Interior Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings, unless otherwise stated.

F. Coordinate work with plaster restoration, paint restoration, interior metalwork restoration, interior masonry restoration, and cutting and patching adjacent to new and existing HVAC and Electrical and other related scope of work.

1.3 RESTORED ARCHITECTURAL WOODWORK QUALITY STANDARDS

A. The Quality Standards, latest edition of the Architectural Woodwork Institute, shall apply to the work of this section. Except as otherwise indicated, provide "Premium Grade" work as defined in the above-referenced standard for all architectural woodwork.

B. Wood Moisture Content: Provide kiln-dried (KD) lumber with an average content range of 6-11 percent. Wood for Transparent Finish: New wood shall match original existing species and grade, or premium grade whichever is more stringent. New inserts in existing wood shall be selected to match grain, color, and pattern.

C. Wood for Painted Finish: comply with quality standards for selection of species, grade and cut. Wood salvaged from the building, deemed to be the same paneling, shall be considered acceptable quality, if the salvaged wood complies with all other requirements set forth herein.

D. Hardware: Hardware shall be restored by others.

1.4 SUBMITTALS

A. Qualification Data: Submit qualification data for firms and people specified in "Quality Assurance" Article that demonstrate expertise, skills and experience. Include a list of at least two (2) completed projects involving architectural woodwork restoration on buildings that are considered landmark, landmark quality or buildings of equivalent historical or architectural significance. List project names, addresses, names of Architect and Owner, plus telephone numbers and other specified information.

B. Survey: Before beginning the work of this Section, photographically document conditions of all items to be restored. Prints shall be minimum 5" x 7", labeled, and keyed to dimensioned drawings showing the locations of the items.
   1. The Survey shall include all locations of woodwork intended to be removed, altered, or repaired, based on a survey of the existing conditions.

C. Schedule: The Contractor shall submit a Schedule of Work, coordinated with the survey, to DCAS. The schedule shall show all woodwork to be refinished in place and woodwork to be dismantled and reinstalled, and include finishes, wood types, locations, dimensions, and types of repairs or replacement of each element prior to reinstallation. The schedule shall indicate the time of completion of each task and shall note accommodation of altered room dimensions. Work shall not proceed until the schedule has been approved by DCAS.

D. Documentation: Documentation shall provide all necessary information to allow installation of new woodwork to interface with existing woodwork and other original material to remain. Documentation shall also be provided for any woodwork contractor elects to remove and reinstall in accordance with the requirements of the drawings. Documentation shall also be performed on woodwork to be removed and replaced with new woodwork; such documentation shall include all dimensions and molding profiles necessary to fabricate new replacement units, of same size or altered dimension.
   1. Documentation Report: Submit Documentation Report for approval, including color photographs or color copies of photographs of existing conditions of all woodwork.
      a. Provide full documentation of every unit as it is disassembled. Documentation

shall be sufficient to allow re-installation of units, where feasible to comply with the requirements of the drawings, or the fabrication and installation of new units. Drawings shall include dimensions and molding profiles of all paneling and all existing supports and grounds.

b. Include all necessary information for the numbering system that allows reinstallation of every altered and unaltered section into its original location.

2. Disassembly Drawings: If Contractor elects to remove and reinstall any woodwork, disassembly drawings must be submitted. Submit for approval one set of prints documenting disassembly procedures of each element so that each element can be re-assembled by reversing disassembly process. Drawings shall show locations of joints, pins, plugs and all other pertinent information. Drawings shall include locations of each salvaged element.

E. Protection Plan: Prior to commencing the dismantling, restoration, alteration and installation operations, the Contractor shall submit to DCAS a written description of proposed materials and methods of protection for preventing damage to any adjacent material or finish during the dismantling, restoration, alteration and installation work of the architectural woodwork, or to any material not being cleaned, and any adjacent material to remain, for approval. Protection shall be installed at all locations where work is in progress so as to protect the woodwork from any damage by other Trades.

F. Product Data: Submit manufacturer's technical product data, installation instructions, and general recommendations for each specified material and fabricated product. Include test reports and certificates substantiating the product's compliance with the specified requirements.

G. Shop Drawings:

1. The Contractor shall submit complete shop drawings of all new architectural woodwork to DCAS for approval. The Drawings shall include dimensioned elevations and sections as well as full size details of all typical members and joinery, types of materials, and shall show hardware and methods of securing and fastening members to adjacent work.
2. Shop drawings shall clearly indicate any deviation from designs or details of the existing woodwork.
3. All dimensional information contained in the design drawings, whether numerical, tabular, or graphic is provided only for the information of the Contractor and is not guaranteed. Contractor shall verify all measurements in the field.
4. Drawings shall be annotated to show room dimensions following installation of vapor barriers, insulation and interior storm sash and other retrofit installations. These dimensions must be verified in the field from existing construction. Drawings shall show location of new blocking required to reinstall woodwork. Drawings shall clearly show proposed modification and alterations of existing woodwork to be completed prior to installation of new work.

H. Samples: Submit for DCAS's approval three (3) samples of each type of new wood for repairs with and without restored finish. Provide full range of color to be found in final finished product.

1. Submit the following items of salvaged woodwork for verification of existing profiles. Complete units shall be retained on site for duration of construction:
   a. Balustrade: one section 2' long,
   b. Wainscot: one complete section including base, frame, panel, and chair rail.

I. Field Installed Mockup
   a. Painted finish.
   b. Clear finish.

1. Consolidation (epoxy repair): The Contractor shall prepare one (1) sample of an epoxy consolidation repair, where indicated by DCAS, including filling of minor holes and depressions in wood surfaces. Following any revisions requested by DCAS, the approved repair shall form a quality standard for all further repair work and shall remain in place until the completion of all work.
2. Clear Finish Cleaning: prepare samples of cleaning of soil, grime and wax from existing wood panel finishes where indicated by DCAS. Prepare samples on the wood surface for DCAS's approval. Resubmit samples until approved.

J. Crate Drawings: The Contractor shall submit shop drawings of crates to be used for shipping and storing of salvaged woodwork. The drawings shall show materials and dimensions of crate, padding, and signage.

K. Samples and mockups submitted which are approved by DCAS shall remain as a record at the site until the Work is completed and approved by DCAS.

1.5 MATERIALS STORAGE AND PROTECTION

A. All materials when delivered to the site shall be so stored to insure proper drainage, ventilation and protection from the elements.

B. All materials dismantled and removed from the site for later reinstallation shall be stored to insure protection from loss, theft, or damage by the elements. Each salvaged item shall be given an individual number which shall be written on the backside of each item. The number shall be keyed into the Disassembly Drawings.

C. Salvaged, repaired woodwork shall not be delivered to the site until ready to be installed.

D. No kiln-dried materials shall be placed in any building unit unless the unit is sufficiently dry. Obtain DCAS's approval before delivering such materials.

E. All wood salvaged for later reinstallation shall be stored in an environment mimicking that of the specific building into which it will be reinstalled.

F. Protect mockups for the duration of the job.

1.6 PROTECTION

A. Take all necessary precautions to protect all persons (whether engaged in the work of this Section or not) from all hazards of any kind associated with the work of this Section.

B. Take all necessary precautions to protect all property and materials (whether subject to the work

of this Section or not) from any harm or damage associated with the work of this Section.

C. Perform all work of this Section in accordance with all Federal, State, and local regulations regarding the transportation, storing, handling, application, removal and disposal of the products involved.

D. Take all necessary precautions to prevent fire and spread of fire.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Follow coating manufacturer's guidelines concerning temperature and humidity requirements for coating application or as specified herein, whichever is more stringent.

B. Glazes and clear coatings must be applied in a dust-controlled environment acceptable to DCAS.

C. Store all architectural woodwork in accordance with Article 1.5, E, above.

D. Maintain environmental conditions, as per Section 1.5E, during and following installation.

E. All materials brought to the site shall be acclimated to these Conditions prior to installation.

PART 2 – PRODUCTS

2.1 ARCHITECTURAL WOODWORK, GENERAL REQUIREMENTS

A. The grades of all materials under this section shall be as defined by the rules of the recognized association of lumber manufacturers producing the materials specified. Wood for millwork shall conform to, or exceed, the requirements of "Premium Grade, Class 1" as established by Quality Standards or the Architectural Woodwork Institute and shall be provided in the cuts and figure required to match existing wood. Where conflicts occur between these standards and this Specification, the more stringent requirement shall govern in each case.

B. Lumber and plywood shall bear the grade and trademark of the association and under whose rules it is produced, and a mark of mill identification.

C. Lumber and finished woodwork throughout shall be of sound stock, thoroughly seasoned, kiln-dried to a moisture content not exceeding 19% for framing and 12% for finish.

D. Work that is to be finished or painted shall be free from defects or blemishes on surfaces exposed to view that will show after the finish coat of paint is applied. Any materials which are in any way defective and not up to specifications for quality and grade, or otherwise not in proper condition, shall be rejected.

E. All glues shall be non-staining waterproof types as manufactured by 3M Company, Pittsburgh Plate Glass Company, or Borden Company, as approved by DCAS.

F. All carpentry and millwork materials exposed to the weather or in contact with masonry or other dissimilar materials shall be preservative treated, including all field cuts and fittings.

2.2 FINISH CARPENTRY AND MILLWORK MATERIALS

A. Quality Standards: The Quality Standards of the Architectural Woodwork Industry (AWI) shall apply and by reference are made a part of this specification.

B. Quality Grade: Material and workmanship of all woodwork shall conform to the Premium Grade requirements of the AWI Quality Standards.

C. New wood for finish millwork shall match existing wood species, Class 1.
   1. Wainscot: Butternut (*Juglans cinerea)*- unless otherwise specified.
   2. Balustrade: Sugar Pine (*Pinus lamberiana)*- unless otherwise specified.
   3. Jury Box walls: Cotton Wood (*Populus* spp)- unless otherwise specified.

D. Joinery of panels, stiles and cross-rails, running and standing moldings, crown moldings, brackets, and other ornamental elements shall be fabricated to match existing, or AWI Premium Grade, whichever is more stringent.

E. All work shall be back painted as specified herein.

2.3 EPOXIES, ADHESIVES, FASTENERS, FILLERS:

A. Epoxy adhesives and consolidants shall be West System, including slow and fast hardeners, and fillers, as manufactured by Gougeon Brothers, Bay City, Michigan; Or an Approved Equal.

B. Adhesives for Fabrication and Repair shall be non-staining, water resistant, aliphatic resin type glue, as made by Borden Company. Or Approved Equal.

C. Fillers for holes and losses in wood: Pigmented oil base putty formulated specifically for use on wood. Provide “Color Putty.” Mix different colors of putty to match color of finished wood.

2.4 FABRICATION OF NEW WOODWORK

A. All work shall comply with AWI Section 1000, Premium Grade for new millwork. Repair existing millwork exactly matching existing joinery, profiles, and dimensions, unless otherwise scheduled for modifications.

B. Work shall be fabricated to designs, dimensions, and details shown on the Drawings and approved shop drawings, and shall replicate existing profiles except where specifically indicated otherwise.

C. All new work to be painted shall be primed and back painted.
   1. Prime paint shall be a brushed application of Devoe Triple Cover House Paint Undercoat, or equivalent as made by Pratt and Lambert of Long Island City, NY; Sherwin Williams Company of Newark, NJ; Benjamin Moore of Milton, MA; Or an Approved Equal.

2.5 FINISH MATERIALS

A. Solvents:
   1. Denatured Alcohol: E.Z. Alcohol, Pure 180 proof denatured ethyl alcohol, as manufactured by E.E. Zimmerman Co., Pittsburgh, PA 15238, Or Approved Equal.
   2. Acetone.
   3. Lacquer thinner.

B. Detergents: Concentrate, synthetic detergent, containing no free alkali, abrasives, acids, caustics or other deleterious materials, such as "Vulpex Liquid Soap," "Orvus," or "Triton XL-80N" distributed by Conservator's Emporium, Reno, NV 89511, (702) 852- 0404; Or an Approved Equal.

C. Oil Varnish: Solution of raw tung oil and polymerized tung oil formulated to be wiped on to wood surfaces. Provide High Luster "Polymerized Tung Oil" as manufactured by Sutherland Welles. Ltd.; Or an Approved Equal.

D. Shellac: Dewaxed "Superblond" shellac freshly mixed in denatured alcohol; Or an Approved Equal.

E. Retouching Crayons: Beeswax sticks impregnated with powdered dry pigments; Or an Approved Equal.

F. Pigments: "Japan" colors; Or an Approved Equal.

2.6 PROTECTION AND MISC. MATERIALS

A. Ethafoam boards, 1/4" to 2" thick boards, 4' by 8'.

B. Gaffers' Tape: 3M.

C. Low-tack Masking: 3M.

D. Plywood, 1/4" to 3/4" thick.

E. 2 x 4 blocking.

PART 3 – EXECUTION

3.1 FIELD CONDITIONS

A. Take all necessary field measurements and verify all installation conditions prior to ordering and fabrication of material.

B. Coordinate work with other trades as required during salvage and restoration operations.

3.2 ARCHITECTURAL WOODWORK SALVAGE

A. Woodwork to remain shall be protected by padded protective barriers to resist damage by the work of other trades. Install protection in accordance with approved protection plan.

B. All existing architectural woodwork to be removed shall be carefully removed, labeled by schedule number, and padded and crated. The Contractor shall be responsible for the safe removal and storage of all interior architectural woodwork. All material that is damaged or lost shall be replaced by the Contractor at no cost to the City.

C. Off-site storage of salvaged materials shall be indoors, and protected from moisture, and extremes of temperature and humidity. Salvaged materials shall be stored off the ground and protected from mechanical or physical damage.

3.3 DISMANTLING OF WOODWORK

A. Document and label all elements scheduled to be dismantled and reinstalled and record on documentation drawings.

B. Document one complete unit of each type scheduled to be removed and replaced by new woodwork indicated on the drawings to match existing or existing profiles.

C. Inspect each element, document as per paragraph 1.4E, and record information for submission to DCAS.

D. Remove sections of woodwork as indicated on the drawings. Disengage wood components from supports, grounds and each other, as necessary without damaging the wood. Drill out plugs and pins, if necessary, to remove from supports and grounds. Dismantle sections to components as required to remove woodwork from the building, wrap each component in bubble wrap, and crate.

E. Record type and locations of existing supports and blocking.

F. Remove crated elements to approved storage location.

3.4 PREPARATION FOR REINSTALLATION OF DISMANTLED WOODWORK

A. Measure dimensions of rooms following installation of all new work by others before altering dismantled woodwork.

B. Prepare shop drawings with details for placement of new furring and blocking and all adjacent conditions required to reinstall woodwork.

C. Prepare shop drawings based on existing room dimensions showing exact location of cuts and include details of all new joinery required to reassemble dismantled woodwork. Include details or modifications as required to coordinate with new systems.

3.5 RESTORATION OF WOODWORK

A. General: Inspect all paneling components for condition. Restore all woodwork, including specific items noted on the Drawings, using methods specified in this section. Restoration work includes all necessary repair work to return wood to a fully intact and structurally sound condition acceptable

to DCAS and is not limited to specific items noted on the Drawings. Finished woodwork shall be fully intact and structurally sound.

1. Protect openings in the work from weather. Dry all wood to moisture content below 17%.

B. Remove and label existing hardware and fixtures.

C. Remove all dirt and debris from woodwork.
   1. Remove all extraneous nails, staples, bolts, hooks, etc. from woodwork. For painted work, fill resulting holes, gouges and indentations, and sand smooth with approved filler material.

D. Replace all missing or otherwise defective wood.
   1. Strip coatings from woodwork to receive transparent finish, and repair on the bench. Otherwise, remove loose paint and sand to featheredge.
   2. Dutchman Repairs: Use wood Dutchmen for holes larger than 1" X 1" X 1/2" deep. For wood with clear finish, use wood Dutchmen for holes and losses larger than 1/4" x 1/4".
      a. Neatly cut out defective materials and enough sound wood to bond Dutchman to sound substrate. Form a prismatic void in existing wood with square corners and edges. Cut Dutchman to exactly fit void. Match profile of exposed portion of Dutchman with original profile of woodwork. Insert grain of Dutchman parallel to original wood grain direction.
      b. Remove loose paint from adjacent wood surface by scraping. Sand existing paint to remain to featheredge joints between existing paint and bare wood of Dutchman.
      c. Adhere Dutchman with glue and clamp (or for frames, nail) in place until glue is set.
      d. Where necessary to cut off an end of a component and install Dutchman, use a diagonal scarf joint for end-to-end joints.
      e. Sand to smooth surface.

E. Fill all miscellaneous holes, cracks and open joints.
   1. For wood to receive painted finish, fill all miscellaneous holes, indentations, gouges, cracks and open joints less than 1" x 1" x 1/2" deep in woodwork with epoxy wood filler.
   2. Fill all miscellaneous holes indentations, gouges smaller than 1/8" in woodwork with colored putty wood filler.

3.6 FABRICATION OF NEW WOODWORK

A. General
   1. All new woodwork fabricated and installed under this section shall be in complete accordance with the requirements of Section 062000.
   2. Remove deteriorated woodwork if new woodwork is to be a replacement.
   3. Where new woodwork is to be installed to accommodate changes in the conformation of the walls, etc., remove and salvage one complete unit of each type, (e.g. panel and chair rail, door casing, etc.), and prepare a dimensioned drawing of each unit, including full scale profiles of all moldings, and panel bevels.

B. Fabrication
   1. Fabricate new woodwork to profiles of existing woodwork. Wood paneling shall have stile

and rail width dimensions matching the existing work. Molding profiles and panel bevels shall also match existing work. Alterations in the dimensions to accommodate changed room conformation shall be made only in the length of the rails and panels. Widths of stiles and casing shall match existing.

2. Finish wood in accordance with finish standards of the AWI for Premium grade.

C. Installation

1. Install woodwork with concealed fasteners wherever possible, and in accordance with approved shop drawings.

3.7 REINSTALLATION OF DISMANTLED WOODWORK

A. Assure that panels, trim and frames are constructed to fit into existing locations without disturbing existing new construction.

B. Install existing components in original locations after restoration and installation of new blocking as required. Do not allow units to be installed in non-original locations.

C. Install woodwork in accordance with approved shop drawings. Plane panels, stiles and rails as required to fit properly and to align with adjacent existing woodwork.

D. Securely attach altered woodwork to new blocking.

E. Install new or repaired trim and casing, adjusting for proper fit.

F. Install all finish hardware and fixtures as specified, accurately fitting, and adjusting hardware as required.

3.8 REFINISHING OF WOODWORK

A. Refinishing of woodwork shall commence after existing finishes have been removed from the woodwork according to the methodologies of Section 099100. Shellac need not be removed.

B. Apply one thinned coat of shellac to the stripped wood.

C. Apply oil varnish to repaired sections of wood and to new woodwork. Apply Oil Varnish evenly with a clean cheesecloth or foam brush. Limit each complete application area to 32 square feet, before beginning next area.

D. Immediately wipe off excess liquid evenly with a new clean cheesecloth. Ensure that no excess liquid remains on wood surface.

E. Repair all blemishes in the wood with putty filler matching the wood finished with oil varnish.

F. Apply second application of oil varnish and wipe off as in the first application.

G. Install refinished hardware, or new as specified.

3.9 FINISHING OF NEW WOODWORK

A. After finish sanding, apply a sealer coat of thinned shellac.

B. Stain new woodwork. Final color of new woodwork with stain and Oil Varnish shall match the color of the existing refinished woodwork.

C. Apply oil varnish to new woodwork. Apply Oil Varnish evenly with a clean cheesecloth or foam brush. Limit each complete application area to 32 square feet, before beginning next area.

D. Immediately wipe off excess liquid evenly with a new clean cheesecloth. Ensure that no excess liquid remains on wood surface.

E. Repair all blemishes in the wood with putty filler matching the existing refinished wood.

F. Apply second application of oil varnish and wipe off as in the first application.

G. Install refinished hardware, or new as specified.

3.10 MEASUREMENT AND PAYMENT

A. Unit Price – SEE BID SHEET

END OF SECTION 064010

SECTION 064023
INTERIOR ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SUMMARY

A. Work Included: Provide millwork in accordance with the Contract Documents. The Work of this Section includes the furnishing of all labor material, equipment, etc. necessary for the fabrication, delivery and installation of millwork, finish carpentry and interior architectural woodwork as shown on the drawings provided, specified herein, or as required and/ or directed by the Architect or DCAS. The Work of this Section shall include but not be limited to the following:

1. Casework, cabinets: countertops and shelving
2. Miscellaneous trim and base work.
3. Cabinet hardware and adjustable shelf hardware.
4. Wood and Metal Access Panel.
5. Courtroom Woodwork (Includes Landmark and/ or Landmark Quality):
6. All other items of finish carpentry work as required or as directed by the Architect or DCAS.
7. Paneling.
8. Baltic edge plywood with honeycomb construction and textured paint.
9. Wood casework with steel facing.
10. Epoxy tops.
11. Hardware for casework.
12. Wood shelving.

1.3 RELATED SECTIONS

A. Section 061000 “Rough Carpentry” for furring, blocking, and other carpentry work not exposed to view.

B. Section 064010 “Architectural Woodwork Restoration.”

C. Caulking between architectural woodwork and any wall, floor, or ceiling joints Section 079200.

D. “Wood doors” Section 081416.

E. Section 099101 “Painting Removal” for removal of paint on woodwork.

F. Section 096519 “Resilient Tile Flooring” for flooring

1.4 QUALITY STANDARDS

A. The quality standards of the Architectural Woodwork Institute, "Quality Standards Illustrated," latest edition, shall apply to all workmanship for architectural woodwork and by reference are made a part of this specification. All work shall conform to "Premium" grade requirements of the AWI "Quality Standards Illustrated," unless otherwise modified herein.

B. In the event of a dispute as to the quality grade (or grades), the Contractor shall call upon the Architectural Woodwork Institute for an inspection under AWI's Quality Certification Program which shall include a QCP Inspection and Report. The Contractor agrees to abide by the decision of this Report. The cost of said inspection and report shall be borne by the Contractor.

C. Employ only tradesmen experienced in the fabrication and installation of architectural woodwork.

D. Millwork manufacturer must be an accredited Quality Certified Premium manufacturer by the AWI.

1.5 SUBMITTALS

A. Product Data for each type of factory-fabricated product and process specified, including details of construction relative to materials, dimensions of individual components, profiles, textures, and colors.
   1. Wood-Preservative Treatment: Include data and warranty information from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material and manufacturer's written warranty.
   2. Fire-Retardant Treatment: Include data and warranty information from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
   3. Waterborne Treatments: For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Wood treatment data as follows, including chemical treatment manufacturer’s instructions for handling, storing, installing, and finishing treated material:
   1. For fire-retardant-treated wood products include certification by treating plant that treated materials comply with specified standard and other requirements.

C. Shop Drawings
   1. Submit shop drawings of all woodwork specified and indicated on the drawings. Shop drawings shall indicate room plans and elevations at 3/4" equals 1'-0" scale and typical construction details at 3" equals 1'-0" scale. Shop drawings shall indicate all materials, thicknesses, and finishes.
   2. Shop drawings shall show all finish hardware, anchors, fastenings and accessories.
   3. Shop drawings for paneling must show complete elevations of rooms to receive paneling as well as panel matching required by these specifications.
   4. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcing specified in other Sections.
   5. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap

dispensers, and other items installed in architectural woodwork.

6. Show veneer leaves with dimensions, grain direction, exposed face. and an identification number indicated for each leaf.
7. Courtroom Woodwork: The description of the courtroom woodwork is general in nature and the Contractor shall refer to all details on the drawings to be provided and shall submit three (3) sets or shop drawings for approval before fabrication and installation.

D. Samples for initial selection of the following in the form of manufacturer's color charts consist of actual or units or sections or units showing the full range of colors, textures, and patterns available for each type of material indicated:
   1. Each type or trim specified 12" long samples.
   2. Plastic laminate, 3 samples, 12" square, for each type, color and surface finish.
   3. Exposed hardware, one unit of each type and finish.
   4. Cabinet door and hardware before construction.
   5. Courtroom Woodwork: Finish paneling (12' x 12" sample), oak cap or balustrade profile fur replacement-in-kind (12" long sample) as directed by the Architect or DCAS for approval, before fabrication and installation.
   6. Granite, finish polished, minimum .sample size 4" x 4" x 3/8" thick. Material test reports from a qualified independent testing agency indicating and interpreting test results relative to compliance of fire-retard ant-treated wood products with requirements indicated.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: All work shall be performed by skilled workers. The Contractor or subcontractor performing the work of this section must have recently completed finish carpentry work similar in scope, material, and extent to that indicated by this section, and whose work has resulted in construction with a record of successful in-service performance.

1.7 COORDINATION

A. Coordinate the work of this Section with other appropriate Sections of the specifications to ensure proper scheduling for fabrication and installation of the work specified herein.

B. Coordinate with partition and finish trades to ensure that proper provisions are made for the installation of the work specified herein.

C. Verify all dimensions in the field prior to fabrication of all Architectural Woodwork to assure proper fit.

1.8 PRODUCT HANDLING

A. All materials and work of this Section shall be protected from damage, from time of shipment from shop to final acceptance of work. Cover, ventilate, and protect work of this Section from damage caused by weather, moisture, heat, staining, dirt, abrasions, any other causes which may adversely affect appearance or use, or which may cause deterioration of finish, warping, distortion, twisting, opening of joints and seams, delamination, loosening, etc., of work of this Section.

B. Keep all finish carpentry, millwork, and cabinet work under cover both in transit and at the premises. Do not deliver any finish carpentry, millwork or cabinet work before it is required for installation. Protect such work to avoid damage in transit, during erection and after erection until acceptance of the building; use all such methods to provide the proper protection. Remove such protection when directed by the Architect.

C. Deliver finish carpentry, millwork, and cabinet work in a dry stable condition; protect same against injury and dampness. Do not store or install finish carpentry, millwork, or cabinet work until after the concrete, masonry and plaster work are thoroughly dry.

D. Damaged or defective items of work of this Section are subject to rejection and replacement with new by Contractor, at no cost to Owner.

1.9 RELATED DRAWINGS, DETAILS AND/ OR PLANS

A. Drawings, details and/ or plans by the Design Consultant or AM of the various courtroom locations will be supplied by DCAS as they become available.

1.10 JOB CONDITIONS

A. Humidity Controls: The ambient relative humidity at the site, including both the storage and the installation areas, shall be maintained between 25% and 55% prior to delivery and through the life of the installation.

B. Determine equilibrium moisture content and maintain required temperature and relative humidity as required for a tolerance of plus or minus one (1) percent of the specified optimum moisture content until woodwork receives specified finishes. Refer to "Guide to Wood Species Selection," AWI, for method of determining equilibrium moisture content values.

C. Examination of Substrate and Conditions: The installer must examine the substrate and the conditions under which the work of this Section is to be performed, and notify the Contractor in writing of unsatisfactory conditions. Do not proceed with work under this Section until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

D. Areas to receive architectural woodwork must be fully enclosed with windows and/ or curtain wall installed and glazed, exterior door in place, HVAC systems operational and temporary openings closed. Any plaster, wet grinding and concrete work shall be fully dry.

E. Architectural woodwork shall be allowed to come to equilibrium on site for 7 days prior to installation.

F. Environmental Limitations: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

G. Field Measurements: Where interior architectural woodwork is indicated to fit to other

construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being concealed by construction, and indicate measurements on Shop Drawings
2. Established Dimensions: Where interior architectural woodwork is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Available Manufacturers: Subject to compliance the requirements, manufacturers offering high pressure decorative laminates or granite which may be incorporated in the work include but are not limited to, the following:
   1. Formica Corp.
   2. Wilson Art – High Pressure Laminate
   3. Chemcore Industries Inc. – sink, faucets & related accessories
   4. Or an Approved Equal.

2.2 MATERIALS, GENERAL

A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," For lumber and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee Board of Review.

B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:
   1. NELMA- Northeastern Lumber Manufacturers Association.
   2. NHLA- National Hardwood Lumber Association.
   3. NLGA- Nationa1 Lumber Grades Authority.
   4. SCMA- Southern Cypress Manufacturers Association.
   5. SPIB- Southern Pine Inspection Bureau.
   6. WCLIB- West Coast Lumber Inspection Bureau.
   7. WWPA- Western Wood Products Association.

C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
   1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece, or omit grade stamps entirely and provide certificates of grade compliance issued by inspection agency.

D. Softwood Plywood: Comply with DOC PS 1, "U.S. Product Standard for Construction and Industrial Plywood.

E. Hardwood Plywood: Comply with HPVA HP-1,"Interim Voluntary Standard for Hardwood and Decorative Plywood."

F. Hardboard: ANS/AHA A135.

G. Medium-Density Fiberboard: Product made without formaldehyde and complying with ANSI A20B.2. Product Class MD.
   1. Product: Subject to compliance with requirements, provide "Medite II" by Medite Corp.;
   2. or an Approved Equal.

H. Particleboard: ANSI A208.1, Grade M-2

I. High Pressure Laminate: NEMA LD 3

J. Granite: Comply with ASTM C97, C99, C170, C241, C880

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Use materials impregnated with fire-retardant chemical formulations indicated by a pressure process or other means acceptable to authorities having jurisdiction to produce products with fire-test-response characteristics specified. Comply with New York City Building Code requirements.

B. Fire-Retardant Chemicals: Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.

C. Fire-Retardant-Treated Lumber: Comply with the following:
   1. Low-Hygroscopic Formulation: Interior Type A per AWPA C20
   2. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other cause, marring, and other defects affecting appearance of treated woodwork.
   3. Discard treated material that does not comply with requirements of referenced standards. Do not use twisted, warped, bowed, discolored, or otherwise damaged or defective material.
   4. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
      a. Low-Hygroscopic Formulation (Type A):
         i. D-Blaze; Baxter: J. H. Baxter Co.
         ii. D-Blaze; Chemical Specialties, Inc.
         iii. Pyro-guard; Continental Wood Preservers, Inc.
         iv. Dricon; Hickson Corp.
         v. Pyro-guard; Hoover Treated Wood Products, Inc
         vi. Or an Approved Equal.

2.4 BASIC REQUIREMENTS AND FABRICATION METHOD

A. General: Except as otherwise indicated, comply with following requirements for Premium Grade

as defined by AWI for millwork items specified.

B. Wood Moisture Content: Provide kiln-dried (KD) lumber with an average moisture content range of nine (9) to twelve (12) percent for exterior work and six (6) to eleven (11) percent for interior work. Wood Moisture Content: Provide kiln-dried (KD) lumber with an average moisture content range of 6% to 11% for interior work. Maintain temperature and relative humidity during fabrication, storage and finishing operations so that moisture content values for woodwork at time of installation does not exceed 5% to 10%.

C. Fabricate woodwork to dimensions, profiles, and details indicated with openings and mortises precut, where possible, to receive hardware and other items of work.
   1. Ease edges to a 1/16” radius, for edges of solid wood (lumber) members less than 1” in nominal thickness, 1/8” radius for edges of rails and similar members over 1” in nominal thickness.

D. Complete fabrication, assembly: finishing, hardware application, and other work before shipment to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary, provide ample allowance for scribing, trimming, and fitting.

E. Pre-Cut Openings: Provide woodwork with. pre-cut openings, where possible, for hardware, appliances, plumbing fixtures, electrical work, telephone cut-outs and similar items. Locate openings accurately and provide proper size and shape. Smooth edges of cutouts and, where located in countertops, seal edges of cutouts with’ a water- resistant coating.

F. Measurements: Before proceeding with woodwork required to be fitted to other construction, obtain field measurements, and verify all dimensions of shop drawing details as required for accurate fit.
   1. Where field measurements before fabrication would delay the project, fabricate without field measurements, and provide ample borders and edges to allow scribing and trimming of woodwork.

G. Solid Wood: AWI Section 100, Grade 1, and as follows:
   1. Opaque Finish: Premium quality medium density fiberboard.
   2. Transparent Finish: Premium quality AWI TR-2.
   3. Concealed: Any hardwood specie, Grade III per AWI Section 100.

H. Plywood: “Veneer core, minimum 3/4” thick unless otherwise noted, interior grade using exterior type waterproof glue.
   1. Provide “A” face plies of 1/26” plain sliced, clear, paint grade for exposed and semi-exposed surfaces to receive “painted” finish.
   2. Provide plywood for “painted” finish with “V” type hardwood edge banding on exposed edges and on all edges of adjustable shelves. Edge band shall be tongued, and pressure glued core with mitered comers.

I. Panel Products: AWI Section 200, particleboard core plywood, with face veneers matched as indicated.

J. Opaque Finish: Premium grade medium density fiberboard which will not show any defects when finished with specified opaque finish.

1. Transparent Finish: Premium quality AWI TR-2.
2. Plastic Laminate: Comply with NEMA LD-3·for Grade GP-SO: O.OSO" thickness, of color, pattern, and finish. Refer to schedule at end of Section.

K. Particleboard: AWI Section 200, particleboard core unless otherwise indicated, with the following requirements.
1. Use particle cores of "Duraflake FR," as manufactured by Willamette Industries, Inc. Or an Approved Equal.
2. Provide facings and edgings as indicated.

L. Courtroom Woodwork (Material):
1. All exposed wood shall be oak of the best grade of its respective kind suitable for the particular purpose intended. It shall be well seasoned, kiln dried, free from shakes, large or loose knots and all imperfections which might impair its strength, durability or appearance.
2. All lumber for framing shall be Nominal Dimension Douglas Fir No. 1. All framing members shall be of sizes shown on plans.
3. Furnish and install wall wood grounds, furring, blocking, sleepers, nailers, etc. that may be necessary, required per drawings or as directed by DCAS.
4. Fastening for wood grounds, furring, blocking, etc. shall be metal and of the type and spacing best suited· to the conditions.
5. Provide wood paneling for Court Rooms as indicated in the drawings.

M. Granite Countertop
1. Adhere to the standards of ASTM and GSA for compressive strength, absorption by weight, density, abrasive resistance, etc.
2. Edge treatments will be eased or bullnosed. Thickness to be 1-1/4". Color, variegation and grain for countertop to be specified by Architect. If granite slabs to be joined, variegation and grain must be continuous and well-matched.
3. Mechanical fastener and adhesive anchoring products and techniques be specified by Architect.

N. Compatibility of Grain and Color: Architect reserves the right to select materials for best compatibility between visually related members and veneers.

O. Machine and sand woodwork to comply with requirements of Standards for specified grade.

P. Fabricate woodwork to dimensions, profiles and details shown. Rout or groove back of flat trim members, kerf backs of other wide flat members except plywood or veneered members.

Q. Miter joints by joining, splining, and gluing to comply with requirements for the specified grade.

R. Inspect each piece of lumber and plywood or each unit of woodwork after drying; do not use twisted, warped, bowed of otherwise damaged or defective wood.

S. Cores and substrates used in the Conservation spaces, and other spaces as noted, shall be free of urea formaldehyde and shall be marine grade plywood.

2.5 INTERIOR STANDING AND RUNNIG TRIM

A. Hardwood Trim: Provide finished hardwood lumber and moldings complying with the following requirements:
   1. Species: Clear, kiln-dried white hardwoods.
   2. Texture: Surfaced (smooth)
   3. Lumber for Transparent Finish (Stained or Clear): Solid lumber stock.

2.6 GENERAL- MATERIALS

A. Softwood lumber shall conform to the requirements of the latest edition of American Lumber Standards Simplified Practice Recommendation R-16. Grades shall conform to the grading rules of the Association having jurisdiction and shall bear the official grade and trademark of the Inspection Bureau of the Association and a mark of mill identification.

B. Framing and Rough Lumber: No. 1 KD grade Southern Pine or Dense Construction grade Douglas Fir, having extreme fiber in bending stress of at least 1700 psi, surfaced four sides (S4S). Provide fire retardant treatment meeting requirements of Section 062000.

C. Grounds, Blocking, Nailers, Furring: Southern Pine, Douglas Fir or Sitka Spruce, grade to suit particular purpose and to be straight, square edged, straight grained, surfaced four sides (S4S), and which will retain nails and screws without splitting. Provide fire retardant treatment.

D. MDF (alternate to Steel Clad Casework): Medium Density Fiberboard painted as specified below.

E. Plywood: AWI Section 200; Shall be Baltic ply exposed edge.

2.7 PLASTIC LAMINATE

A. Face Sheets: NEMA Publication Grade LD3 , Grade GP50, Type I. 0.05” in thick, as Face Sheets: NEMA Publication Grade LD3 , Grade GP50, Type I. 0.05” in thick, as selected by Architect.

B. Backing Sheets: Non-decorative, high –pressure plastic laminate, NEMA LD3, Grade BK20, 0.02” thick.

C. Edges: finish with plastic laminate to match face and applied before face sheets are applied, unless otherwise shown or specified

2.8METAL

A. Steel
   1. Steel Plate cladding of millwork: 14 gauge, with welded returns, powder coated with Kynar 500 or approved equal.
      2. Structural Steel Shapes and Plates: ASTM A 36.
   3. Hot-Rolled Carbon Steel Sheets: Commercial quality, ASTM A 569, may be used for concealed parts only. Galvanize sheets for planters.
      4. Finishes (concealed)
      a. Primer for Unexposed Metal: Zinc chromate primer.

2.9MISCELLANEOUS MATERIALS

A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
   1. Where finish carpentry materials are exposed in areas of high humidity, provide fasteners and anchorages with hot-dip galvanized coating complying with ASTM A 153

B. Fasteners
   1. Wood Screws: FS FF-S-111, type, size, material and finish as required for the condition of use.
   2. Nails: FS FF-N-105, type, size, material and finish as required for the condition of use.
   3. Anchors: Type, size, material and finish as required for the condition of use.
   4. Staples: Upholstery type staples of sufficient strength to hold fabric taut in place without sagging.
   5. Panel Supports: Provide wood veneer panel supports where indicated.

C. Adhesives
   1. For Laminating Plastic Laminate Surfaces: Melamine, phenol-resin, or resorcinol-resin complying with FS MMM-A-181; type, grade and class best suited for the purpose.
   2. For All Other Uses: Moisture resistant complying with FS MMM-A125, Type II, or MMM-A-188, Type I II or III, ; type best suited for the purpose.
   3. All adhesives shall meet (MSDS) Material Safety Data Sheet Standards.

D. Grommets: Provide diameters shown; satin finished chrome grommet sleeves sizes as indicated on drawings.

E. Glue: Aliphatic- or phenolic-resin wood glue recommended by manufacturer for general carpentry use.

2.10 FABRICATION, GENERAL

A. General: Provide architectural woodwork visible from anyone space or room fabricated from a single flitch obtained from the same tree, and shall match in cut grain, color, finish, and other aesthetic effects.
   1. All woodwork for a given floor to be selected from the same flitch obtained from a single tree.

B. Provide steel framing and lumber framing for architectural woodwork, complete with all bracing and fastening devices as required for a rigid installation, and as required to sustain the imposed loads.

C. Do all fabrication from field measurement with provision for scribing as required to meet built-in conditions.

D. Coordinate the work of this Section with the work of other trades.

E. Fabricate units in largest practicable sections. Trial fit in the shop, disassemble for

shipment and reassemble with concealed fastener.

F. Fabricate architectural woodwork from specified veneers, all sapwood and other imperfections shall be clipped out. Each elevation of specified woodwork shall be of a single flitch. Each item of woodwork for this project shall be fabricated of veneers from a single tree.

G. Maintain relative humidity and temperature during fabrication, storage and finishing operations matching that of the areas of installation.

H. Details indicate the required type of construction. Modifications to conform to manufacturer's standards will be considered providing they comply with the Contract Documents, maintain the profiles shown and subject to acceptance by DCAS.

I. Reinforcing shown is minimum. Provide additional reinforcing as required to ensure a rigid assembly. Exposed surfaces shall be free from dents, tool marks, warpage, buckle, glue and open joints, or other defects. Accurately fit all joints, comers and miters. Conceal all fasteners. Make threaded connections up tight so that threads are entirely concealed.

J. Provide openings for hardware, appliances, plumbing fixtures and electrical work. Locate openings accurately and use templates or diagrams, or proper size and shapes. Smooth edges of cutoffs and seal edges of cutouts in countertops with a water-resistant coating.

K. Factory finish all items where possible. Defer final touch-up, cleaning and polishing until after delivery and installation.

L. Comply with AWI Section 1500, Premium Grade for sanding, filling countersunk fasteners, back priming and similar preparations for the finishing of architectural woodwork, as applicable to each unit of work.

M. Prepare all countersunk wood screw attachments for wood plugs. Wood plugs shall match surrounding species and grain direction; putty filling is not acceptable.

N. Provide balancing sheets as required, and specified, complying with referenced AWI standards.

1. Faces shall be of one or more pieces of veneer matched for color and grain at the joints to produce continuity of character and balanced design. Faces shall be free of open joints, face depressions, glue stains or other manufacturing defects. Faces shall not contain ruptured grain, doze, or shakes.
2. All wood finish shall be accurately milled to detail with clean cut molding, profiles, and lines, machined, sanded perfectly smooth, be housed joined blocked put together in the best manner, with provisions for swelling, splitting or opening of joints.
3. The finished woodwork in so far as practicable and as construction conditions permit shall be assembled, finished and carefully pre-fitted at the shop and delivered to the site in complete units ready to set in place, and shall be able to fit through a 3'-0" x 7'-0" door opening.
4. Jury Box platform, Judge's Bench and Witness Stand shall be as shown and called for in the plan and shall be complete with wood faced railings, caps, molding,

trim, etc.

5. Railing shall be complete (including swinging gates and matching hardware) with all necessary supports and anchors as detailed on the drawings. All members and components necessary for a complete assembly and installation will be required (including the replacement-in-kind of balustrade profiles).

2.10 CABINET HARDWARE

A. Schedule of acceptable cabinet hardware.
   1. Drawer glides: “Grant”; Model #328 (up to 50 lbs.); #329 (over 50 lbs.)
   2. Back-mounted hinges: “Stanley”; Series #1560, size to suit.
   3. Shelf supports: “Grass” of America.
   4. Magnetic catches: “Ives”; Series #323/per leaf.
   5. Shelf pins and ferrules: “Grass”; stainless steel

2.11 FACTORY FINISHING OF INTERIOR ARCHITECTURAL WOODWORK

A. Quality Standard: Comply with AWI Section 1500 unless otherwise indicated.

B. General: The entire finish of interior architectural woodwork is specified in this section, regardless of whether factory applied or field applied touch-up after installation.

C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces and similar preparations for finishing of architectural woodwork, as applicable to each unit of work.

D. Transparent Finish: Comply with requirements indicated below for grade, finish system, color, effect, and sheen.
   1. Grade: Premium.
   2. AWI Finish System: TR-2- Catalyzed Lacquer.
   3. Stain and Effect: Natural satin luster appearance.
   4. Sheen: Semi-gloss.

E. Opaque Finish: Comply with requirements indicated below for grade, finish system, color, effect, and sheen.
   1. Grade: Premium.
   2. AWI Finish System: OP-2- Catalyzed Lacquer.
   3. Color and Effect: As selected by Architect.
   4. Sheen: Natural satin luster appearance.

2.12 BALTIC PLY EDGE ASSEMBLY (BASIS OF ALL CABINETRY)

A. Provide custom Baltic edge plywood, and exposed Baltic edge with textured sprayed applied metallic paint system (Hammerlite; or an Approved Equal) to match Architect’s sample.
   1. Exposed edge of plywood and other areas not receiving metal to receive clear washable shop applied finish equal to System 5 clear conversion varnish per AWI Premium Grade standard.
   2. Interiors of all Cabinetry to be receive maple ply veneer as indicated drawings Finish

specified herein.

B. Doors shall receive custom pivot hinges.

2.13 EPOXY COUNTERTOPS

A. Material: Chemical and abrasion resistant, durable top of one-inch-thick cast material of epoxy resins and inert products, cast flat, with a uniform non-glare black matte finish.

B. Backsplash Curb: Same material as top, 4" high (unless otherwise shown), butt jointed and cemented to top. Provide where indicated on drawings where tops abut wall surfaces. Include end curb where top abuts end wall.

2.14 CABINET HARDWARE

A. Architectural Woodwork Hardware: Provide the following items, or their approved equal, as required:
1. Hinges: Hafele concealed hinges.
2. Catches: Magnetic; top and bottom.
3. Pulls: Selected by the Architect.
4. Locks: Directed by the Architect.
5. Drawer Slides: Accuride, Model 7434, full extension, 100 lb. capacity.
6. Shelf Supports: Pin and grommet system equal to No. 282.01.701 pin and 282.50.704 grommet made by Hafele.
7. Finish: Satin Stainless Steel.
8. Closet Hardware: Oval wardrobe rails, chrome plated steel with center bracket and wall support brackets made by Hafele;
9. or an Approved Equal.

2.15 FABRICATION- SPECIFIC ITEMS

A. Casework
1. Provide casework in accordance with AWI Section 400, Premium Grade.
2. Include all preparations for mechanical, electrical, telephone and plumbing work required.
3. Provide cabinet hardware for casework as shown.
4. Provide dust panels in body webs and between drawer units.
5. Provide wood veneers for exposed surfaces as specified herein before.
6. Hollow core doors will not be permitted.
7. Provide matching veneers for edge treatments of case body members where transparent finishes are indicated or specified.
8. Provide drawers with slides as specified. Drawers shall not rest on web body frames.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting installation and performance of

finish carpentry. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Courtroom Woodwork: installer must examine the areas and conditions under which the courtroom woodwork will be installed. Notify DCAS in writing of the conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

C. Examine the areas and conditions where architectural woodwork is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 SCHEDULING

A. The Contractor shall begin diligently to fabricate all the above millwork and as each of the various courtroom spaces become available, the Contractor shall be notified to begin installation of his work at such premises.

B. The Contractor shall complete all of his fabrication and installation without the various premises interfering with the courtroom activity.

C. Electrical work will be done by others, but the Contractor shall cooperate with such parties so that the work can be completed within the allowed contract time.

3.3 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Condition finish carpentry to average prevailing humidity conditions in installation areas before installation, for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

C. Prime and back-prime lumber for painted finish exposed on the exterior. Comply with requirements for surface preparation and application in Division 9 Section “Painting.

3.4 INSTALLATION, GENERAL

A. Do not use finish carpentry materials that are unsound, warped, improperly treated, or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
   1. Do not use manufactured units with defective surfaces, sizes, or patterns.

B. Install finish carpentry plumb, level, “true, and aligned with adjacent materials. Use concealed shims where required for alignment.
   1. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
   2. Countersink nails, fill surface flush, and sand where face nailing is unavoidable.
   3. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) for plumb and level. Install adjoining finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush

installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.

4. Coordinate finish carpentry with materials and systems in or adjacent to standing and running trim and rails. Provide cutouts for mechanical and electrical items that penetrate exposed surfaces of him and rails.

C. Finish according to specified requirements.

D. Refer to Division 9 Sections for final finishing of finish carpentry.

E. All work shall be carefully assembled and fastened together to provide secure and true construction. All fastening shall be concealed in the finish work. The work is to be offsite in largest possible sections but must be able to be broken down for delivery through min. 3' x 7' door opening.

F. All finished work shall be erected plumb and true and in accordance with the best methods known to the cabinet makers' trade. Surfaces shall be true and free from all machine and tool markings, bruises, indentation, chips or abrasions.

G. All finished work shall be properly installed and otherwise substantially fastened, in place as best suited for each condition ad as needed to permanently hold it to correct lines and levels.

H. General: Installation shall conform to the requirements of Section 1700 of AWI "Quality Standards Illustrated," 8th Edition.

I. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation.

3.5 WOOD FINISHES – COURTROOM WOODWORK

A. Panels shall be finished with four (4) coat conversion lacquer system consisting of sealer, combination filler-stain and two (2) separate coats of final finish.

B. Sealer coat to be compatible with final coats specified. Sealer shall be applied by spray or roller, thoroughly dried to a solid film and then lightly sanded. Combination filler-stain to be sprayed or rolled on and fully padded into surface and wiped off. Final finish to consist of two (2) coats of clear, durable catalyzed conversion lacquer.

C. Wood splines and cornice him shall be factory finished in black enamel satin finishes, or as specified and/ or as directed.

D. All courtroom woodwork shall be finished. The finishing of all courtroom woodwork shall be deemed included in the Unit Price.

3.6 RAILING AND GATE HARDWARE – COURTROOM WOODWORK

A. Courtroom Railing: Courtroom railing shall include panel work construction with oak veneer plywood, solid oak trim, base and cap, or solid oak balustrade railing to match and/ or replace in kind (includes Landmark and/ or Landmark Quality) or as directed

by the Architect and/ or DCAS. All oak shall be premium quality.

B. Hardware: Gate hardware shall be double acting spring gate hinges of sizes and weight required for weight of the wood gate (minimum of 2 per gate). Hinges shall be as manufactured by Bommer (US10B finish), or an Approved Equal.

3.7 STANDING AND RUNNING TRIM INSULATION

A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches (610 mm) long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints, if required.
   1. Match color and grain pattern across joints.
   2. Install trim after gypsum board joint finishing operations are completed.
   3. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

3.8 SHELVING

A. Shelves shall be constructed of 3/4” thick oak veneered plywood, unless otherwise specified. Plywood shall be free from knots, cracks, blemishes, etc. and sanded smooth.

B. Wood finish shall be one (1) coat of stain and two (2) coats of polyurethane. Color of stain shall be selected by Architect. Approval of stain or equal will be required before application.

C. All cut edges are to be finished with iron-on wood grain tape to match wood veneer or with 1/4” thick solid K.D. strip on all edges.

3.9 COUNTERS AND COUNTERTOPS

A. All woodwork shall be carefully cut and constructed throughout to conform with finished dimensions as shown in drawings to be provided keeping with the best practice of the trade. Work shall be pre-assembled as far as practical. No work shall be installed until surface is cleaned leveled and fully prepared.

B. Lumber and plywood used for construction shall be fire retardant treated. Affidavits attesting to this shall be submitted for each type.

C. All woodwork comer joints shall be blind mitered, dovetail connected. Nailing and gluing shall be neat sufficient and invisible wherever possible and shall result in a rigid and squeak- free construction. All cut edges are to be finished with iron-on wood grain tape to match wood veneer.

D. All lumber and plywood shall be straight, true and level, free of warpage, splitting, serious cracking, knots and other defects affecting the strength and appearance. Lumber

shall be construction grade 1 (1400 lbs. Fiber stress to be grade and trade marked). All exposed lumber and plywood shall be oak wood and shall be kiln dried. Counters shall be constructed of 3/4" architectural grade plywood. Drawers shall be constructed from 1/2" oak veneer plywood, provided with drawer slide hardware for easy pulling and return, and any and all hardware and fastenings as required and necessary.

E. Counter shall be provided with drawer units and shelves as shown on the drawings and specified herein. Drawers and shelves shall be square and true, sanded and prepared ready for varnish.

F. Countertop should be prepared to receive 1-1/4" granite as indicated following manufacturer's recommendations.

G. Granite countertop will be vanity mounted or wall hung on full perimeter steel support angles and will include all cutouts required. For every 30" of width contractor shall provide a minimum of one (1) sink cutout to accept all related faucets and accessories.

3.10 CABINETS

A. Cabinets shall be installed in locations shown on the plan and required to fit flush with line of window wall cabinetry. Cabinets shall be pairs of double door cabinets, of approximate finish dimensions 24" deep exterior and a height of 30" or up to the height of the finished windowsill.

B. Cabinets shall sit on a board of continuous 2" x 4" lumber. Forming a 4" high toe space covered in vinyl base moldings and topped with oak trim.

C. Cabinets shall have a top counter of oak veneer plywood finish as selected and vertical surfaces shall be covered in hardwood veneer paneling as described in the drawing. All cabinets shall be edged in oak trim as described.

D. Doors shall be of oak plywood with solid edge throughout. Doors shall be hung on one pair of fully concealed self-closing cabinet door hinges, so that doors fully overlap frames, and no interior color or edge is visible when closed. Doors when open shall hold back against cabinets without damaging any woodwork or hardware.

E. Cabinets shall contain one 5/8" thick shelf covered on all sides with the same interior color of birch plywood. Shelf shall be easily adjustable on metal clips fitting into pre-coated slotted standards painted to match interior finish, or approved fastening.

F. Doors shall be fitted with built-in hand grab, allowing an open area for grabbing of at least 1" deep and 3-1/2" long. Doors shall be fitted with interval positive fastening devices top and bottom and an approved pin tumbler cylinder lock, with bolt throw sufficient for easy and secure locking of each pair of doors. The Contractor shall supply four keys for each pair of cabinets (4 doors) to be keyed alike. The Contractor shall submit one complete door with hardware for approval before proceeding with construction.

3.11 ALL PURPOSE ACCESS PANEL

A. The Contractor shall furnish and install an all purpose access panel minimum size approximately 24" x 30" for use in plastered, masonry, drywall and certain ceiling surfaces. Exact dimension shall be in accordance with the site condition and as provided by the Architect.

B. The all-purpose access panel shall provide convenient access for inspection or services to vital components or utility services. Panel material shall be as directed by the Architect and in accordance with specifications.

3.12 WOOD ACCESS PANEL

A. Wood access panel shall have a frame of oak; kiln dried solid lumber and panel cover of 1" thick veneer plywood with solid oak edge trims. Hinge shall be of concealed continuous stainless steel. Latch shall be flush mounted key lock or tamper resistant latch. Finish shall be one (1) coat of stain and two (2)" coats of polyurethane unless otherwise specified by the Architect.

3.13 METAL ACCESS PANEL

A. Metal access panel shall have frame of 060-6063 T6 extruded aluminum and panel corner of 0.060 aluminum as manufactured by "CESCO Products," or approved equal. Hinge shall be concealed continuous stainless steel. Latch shall be flush mounted key lock or tamper resistant latch. Finish shall be galvanized steel/mill.

3.14 FRAMING

A. Use specified framing lumber, sizes and spacing as indicated on drawings and as required to support loads.

B. Framing shall be cut square on bearings, closely fitted, accurately set to required lines and levels, rigidly secured in place at bearings and connection with nails, lag screws and/ or bolts as required by conditions.

3.15 GROUNDS, BLOCKING, NAILERS AND FURRING

A. Provide all wood grounds, blocking, nailers, furring, and the like for work of this Section, where shown and where required, dressed to size indicated or required to suit the condition. Install grounds, blocking, nailers, furring, etc., rigidly, in proper alignment, trued with a long straight edge.

3.16 ROUGH HARDWARE

A. Provide all rough hardware, such as nails, screws, bolts, anchors, hangers, clips and similar items. Hardware shall be of the proper size and kind to adequately secure the work together and in place, in a rigid and substantial manner. Use galvanized hardware at exterior walls, and at other locations where subject to moisture or where water will be present.

B. Secure wood to concrete and to solid masonry with countersunk bolts in expansion sleeves or other approved manner, to steel with countersunk bolts, to hollow masonry and to drywall with heavy duty countersunk toggle bolts. Space fastenings not more than sixteen (16) inches apart. Hardened cut nails, powedriven fastenings, or other suitable devices may be used where approved by the Architect.

C. Connections and fastenings shall be made in such manner as will compensate for swelling and shrinkage and shall permit the work to remain permanently in place without any splitting or opening of joints.

3.17 INSTALLATION OF CABINET FINISH HARDWARE

A. All items of finish hardware furnished under this Section shall be carefully fitted and secured in place as part of the work of this Section. Locations and positioning of hardware shall be subject to the Architect's approval. Care shall be taken not to mar or damage hardware, or other work. Install doors plumb and true. Hardware shall be fitted to assure operation without forcing.

B. After preliminary fitting of hardware, the Contractor shall remove trim for painting and finishing work; after which he shall reinstall the hardware in a permanent manner.

C. Upon completion of the work, before final acceptance of the building by the Owner, the Contractor shall, in the presence of the Architect, show that all hardware is in satisfactory working order; fit all keys in their respective locks and, upon acceptance of the work, shall tag and deliver all keys to the Architect and Owner.

D. When directed by the Owner, at any time during the first year after the completion of the Contract, the Contractor shall return to the building and adjust and refit the work and hardware and leave such items in satisfactory working order.

3.18 PAINTING AND FINISHING

A. General: All painting and finishing work of this Section shall be shop applied, unless otherwise noted, as specified below. All painting and finishing shall match approved samples. Field finish painting, where specified below, shall be by painting Subcontractor, as specified for in Painting Section.

B. Schedule of Painting and Finishing
   1. Shop Finish On:
      a. Paneling.

C. Back-Painting: All work of this Section in contact with concrete or masonry or other moisture areas and all concealed surfaces of cabinet and millwork, shall be back- painted with one (1) coat of oil-based paint prior to installation, shop applied where practicable.

D. Field Touch-Up: Field touch-up shall be the responsibility of the installing Subcontractor and shall include the filling and touch-up of exposed job made nail or screw holes, refinishing of raw surfaces resulting from job fitting, repair of job inflicted scratches and mars, and final cleaning up of the finished surfaces.

3.19 ADJUSTING

A. Repair damaged or defective finish carpentry where possible to eliminate functional or visual defects. Where not possible to repair, replace finish carpentry. Adjust joinery for uniform appearance.

3.20 CLEAN UP AND PROTECTION

A. Clean Up: At regular intervals during the course of the work, all debris and excess material shall be cleaned up and removed from the site. Upon completion of installation, clean all spaces of debris caused by woodwork installation.

B. Protection: Protect all woodwork from marring, defacement of other damage until final completion and acceptance of the project by the Owner. Repair or replace all defective units prior to final inspection as directed by the Architect. Any units that cannot be satisfactorily repaired in the opinion of the Architect shall be replaced with new units of same original design, at no additional cost to the Owner.

C. Provide final protection and maintain conditions that ensure finish carpentry is without damage or deterioration at the time of Substantial Completion.

3.21 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

B. All millwork furnished and installed under this Section of the Work shall include the finishing with a stain (submit sample for approval) and two coats of polyurethane, unless noted otherwise. The finishing of all millworks shall be deemed included in the Unit Price, at no additional cost to the City.

END OF SECTION 064023

SECTION 071353
ELASTOMERIC SHEET WATERPROOFING

PART 1 – GENERAL

1.1 SUMMARY

A. Work Included: Provide sheet membrane waterproofing in accordance with the Contract Documents. The Work of this Section shall include but not be limited to the following:
   1. EPDM rubber sheet waterproofing.
   2. Butyl rubber sheet waterproofing.

B. Related Sections
   1. Division 9 Section – "Tiling".

1.2 QUALITY ASSURANCE

A. Special Experience Requirements:
   1. Installer Qualifications: A firm with recent successful waterproofing projects similar to requirements for this project.
   2. Manufacturer's Qualifications: Obtain primary waterproofing materials from a single manufacturer with not less than 5 years of successful experience in sheet waterproofing work. Provide secondary materials only as recommended by manufacturer of primary materials.

1.3 PREINSTALLATION MEETINGS

A. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, installation instructions, and general recommendations for each material required. Include data substantiating that materials comply with requirements.
   1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
   2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

B. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, expansion joints, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer

B. Field quality-control reports

C. Sample Warranties: For special warranties.

1.6 JOB CONDITIONS

A. Substrate: Proceed with work of this section only after substrate construction and penetrating work have been completed.

B. Ventilation: Provide ventilation to remove hazardous fumes during application and cure of solvent based components in enclosed spaces and maintain ventilation until full cure.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended in writing by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
   1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.8 GUARANTEE

A. In accordance with the Article on Guarantees in the General Conditions, the Contractor hereby guarantees that all work specified in this Section will be free from defects of materials and workmanship for a period of five (5) years.

B. Furnish a guarantee in the form specified in the Article on Guarantees in the General Conditions governing all contracts.

C. The following types of failure will be adjudged as defective work:
   1. Abnormal aging or deteriorating of materials.
   2. Failure of sheet waterproofing.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include but are not limited to the following:
   1. W.R. Grace & Co.
   2. Pecora Corporation.
   3. W.R. Meadows, Inc.

4. Or an Approved Equal.

2.2 SHEET WATERPROOFING, MATERIAL

A. Self-adhering membrane of rubberized asphalt integrally bonded to polyethylene sheeting, formed into uniform flexible sheets of thickness shown, or not less than 56 mils if no thickness is shown, complying with the following:
   1. Tensile Strength: 250 psi min; ASTM D 412.
   2. Ultimate Elongation: 300 percent min.; ASTM D 412.
   3. Brittleness Temperature: -45 deg. F, ASTM D146.
   4. Hydrostatic Head Resistance: 150 feet min.
   5. Water Absorption: Not more than 0.1 percent weight gain after 48 hours or immersion at 70 deg. F; ASTM D 570.

B. Products: Subject to compliance with requirements, provide one of the following:
   1. Bituthene; W.R. Grace & Co.
   2. Duramem 700-SM; Pecora Corp.
   3. MEL-ROL; W.R. Meadows, Inc.
   4. Or an Approved Equal.

2.3 MISCELLANEOUS MATERIALS

A. Primer: Provide type of concrete primer recommended by manufacturer of sheet waterproofing material for applications required.

B. Flashings and Accessories: As recommended by manufacturer of waterproofing membrane.

C. Insulation, General: Comply with Division 7 Section “Thermal Insulation”.

PART 3- EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements and other condition affecting performance of the waterproofing.
   1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
   2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean substrate and remove projections and substances detrimental to work; comply with instructions of membrane manufacturer.

B. Prime substrate as recommended by prime materials manufacturer.

C. Mask off adjoining surfaces, where necessary to avoid soiling materials outside membrane area.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill. Prime, and treat joint and cracks in substrates. Remove dust and dirt from joint and cracks according to ASTM D 4258.

F. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions.

3.3 INSTALLATION

A. Comply with manufacturer's instructions. Provide complete waterproofing membranes over areas to be waterproofed. Seal projections through the membrane and seal seams. Provide installation with as few amounts of seams as possible.

B. Bond membrane to surfaces as recommended by the membrane manufacturer.

C. Install sheet-type flashings where recommended by prime materials manufacturer. Except as otherwise shown, extend flashings not less than 4" onto adjacent perpendicular surfaces.

3.4 FIELD QUALITY CONTROL

A. Flood Testing: Flood test each deck area for leaks, according to recommendations in ASTM D 5957, after completing waterproofing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
   1. Flood to an average depth of 2-1/2 inches (64 mm) with a minimum depth of 1 inch (25 mm) and not exceeding a depth of 4 inches (100 mm). Maintain 2 inches (51 mm) of clearance from top of sheet flashings.
   2. Flood each area for 48 hours.
   3. After flood testing, repair leaks, repeat flood tests, and make further repairs until waterproofing installation is watertight.

B. Engage an independent testing agency to observe flood testing and examine underside of decks and terminations for evidence of leaks during flood testing.

C. Prepare test and inspection reports.

3.5 PROTECTION, REPAIR, AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Protect installed board insulation and insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

D. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

E. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.6 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

B. Above unit prices include all required surface

END OF SECTION 071353

SECTION 071413
HOT FLUID-APPLIED RUBBERIZED ASPHALT WATERPROOFING

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Contract Documents apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Rubberized-asphalt waterproofing membrane**,** unreinforced and reinforced.
2. Molded-sheet drainage panels.
3. Insulation.
4. Plaza deck pavers.

B. Related Sections:
1. Division 07 Section "Joint Sealants" for joint-sealant materials and installation.

1.3 **ACTION SUBMITTALS**

A. Product Data: Submit product data for each type of product indicated in Part 2 of this Section. Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins to adjoining waterproofing, and other termination conditions.
1. Include setting drawings showing layout, sizes, sections, profiles, and joint details of pedestal-supported concrete pavers.

C. Samples: Submit samples of the following products in manufacturer's standard sizes unless otherwise indicated. List of manufacturers is listed in Part 2 of this Section:
1. Flashing sheet.
2. Membrane-reinforcing fabric.
3. Insulation.
4. Drainage panel.
5. Plaza deck paver, full sized in each color and texture required.
6. Paver pedestal assembly.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: Submit reports that demonstrates capabilities and experience of the Installer.

B. Product Test Reports: Submit reports for waterproofing, based on evaluation of comprehensive

tests performed by a qualified testing agency.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that is approved, authorized. or licensed by manufacturer for installation of waterproofing required for this Project and is eligible to receive manufacturer's special warranties.

B. Source Limitations: Obtain waterproofing materials, sheet flashings, protection course, molded-sheet drainage panels, insulation, pavers and pedestals from single source from single manufacturer.

C. Mockups: Install waterproofing to 100 sq. ft. of deck to demonstrate surface preparation, crack and joint treatment, corner treatment, thickness, texture, and execution quality. Install pavers and pavers supports to demonstrate aesthetic affects and set quality standards for materials and execution.
   1. If Architect determines mockups do not comply with Contract requirements, reapply waterproofing and reinstall overlaying construction until mockups are approved.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Preinstallation Conference: Conduct conference at Project site.
   1. Review waterproofing requirements of the Contract including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer.

B. Remove and replace liquid materials that cannot be applied within their stated shelf life.

C. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate, or when temperature is below 0 degrees Fahrenheit.
   1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during application and curing of waterproofing materials.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace waterproofing and sheet flashings that do not comply with Contract requirements or that fail to remain watertight within specified warranty period.
   1. Warranty insulation will retain 80 percent of original published thermal value.
   2. Warranty pavers will not dish or warp and will not crack, split, or disintegrate in freeze-thaw conditions.
   3. Warranty includes removing and reinstalling protection board, drainage panels, insulation, pedestals, and pedestal-mounted pavers on plaza decks.
   4. Warranty Period: Ten (10) years from date of Substantial Completion.

B. Special Installer's Warranty: Submit roofing Installer's warranty, without monetary limitation, signed by Installer, covering Work of this Section, for warranty period of ten (10) years from date of Substantial Completion.
   1. Warranty includes removing and reinstalling protection board, drainage panels, insulation, pedestals, and pedestal-mounted pavers on plaza decks.

PART 2- PRODUCTS

2.1 WATERPROOFING MEMBRANE MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work:
   1. American Hydrotech, Inc.
   2. American Permaquik Inc.
   3. Barrett Company.
   4. Carlisle Coatings & Waterproofing Inc.
   5. Henry Company.
   6. Tamko Waterproofing.
   7. Tremco Incorporated.
   8. Or an Approved Equal.

2.2 WATERPROOFING MEMBRANE

A. Hot Fluid-Applied, Rubberized-Asphalt Waterproofing Membrane: Single component; 100 percent solids; hot fluid-applied, rubberized asphalt.
   1. Products: Subject to compliance with Contract requirements, provide one of the following available products that may be incorporated into the Work:
      a. American Hydrotech, Inc.; Monolithic Membrane 6125.
      b. American Permaquik Inc.; Permaquik 6100.
      c. Barrett Company; Ram-Tough 250.
      d. Carlisle Coatings & Waterproofing Inc.; CCW-500R.
      e. Henry Company; 790-11.
      f. Tamko Waterproofing; TW-Hot Melt.
      g. Tremco Incorporated; Tremproof 150.
      h. Or an Approved Equal.

2.3 FLASHING SHEET MATERIALS

A. Elastomeric Flashing Sheet: 50-mil minimum, uncured sheet neoprene as follows:
   1. Tensile Strength: 1400 psi. minimum; ASTM D 412, Die C.
   2. Elongation: 300 percent minimum; ASTM D 412.
   3. Tear Resistance: 125 psi. minimum; ASTM D 624, Die C.
   4. Brittleness: Does not break at minus 30 deg F; ASTM D 2137.

2.4 AUXILIARY MATERIALS

A. Primer: ASTM D 41, asphaltic primer.

B. Elastomeric Sheet: 50-mil- minimum, uncured sheet neoprene as follows:
   1. Tensile Strength: 1400 psi minimum; ASTM D 412, Die C.
   2. Elongation: 300 percent minimum; ASTM D 412.
   3. Tear Resistance: 125 psi minimum; ASTM D 624, Die C.
   4. Brittleness: Does not break at minus 30 deg F; ASTM D 2137.

C. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum termination bars; approximately 1 by 1/8-inch-thick; with anchors.

D. Sealants and Accessories: Manufacturer's recommended sealants and accessories.

E. Reinforcing Fabric: Manufacturer's recommended, spun-bonded polyester fabric.

F. Protection Course: ASTM D 6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:
   1. Thickness: 1/8 inch to 1/4-inch, nominal.
   2. Thickness: 1/8-inch, nominal, for vertical applications; 1/4-inch, nominal, elsewhere.

G. Protection Course: Manufacturer's standard, 80- to 90-mil-thick, fiberglass-reinforced rubberized asphalt or modified bituminous sheet.

2.5 MOLDED- SHEET DRAINAGE PANELS

A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 sieve, laminated to one side with a polymeric film bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a vertical flow rate of 9 to 15 gpm/ft.

B. Woven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a woven-geotextile facing with an apparent opening size not exceeding No. 40 sieve, laminated to one side with a polymeric film bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a horizontal flow rate not less than 2.8 gpm/ft.

2.6 INSULATION

A. Board Insulation: Extruded-polystyrene board insulation complying with ASTM C 578, square or shiplap edged.
   1. Manufacturers: Subject to compliance with Contract requirements, products of this Section may be provided by one of the following available manufacturers:
      a. DiversiFoam Products.
      b. Dow Chemical Company (The).
      c. Owens Corning.
      d. Pactiv Corporation.
      e. T. Clear Corporation.
      f. Or an Approved Equal.
   2. Type IV, 25-psi minimum compressive strength.
   3. Type VI, 40-psi minimum compressive strength.
   4. Type VII, 60-psi minimum compressive strength.
   5. Type V, 100-psi minimum compressive strength.

B. Unfaced Wall Insulation Drainage Panels: Extruded-polystyrene board insulation complying with ASTM C 578, Type VI, 40-psi minimum compressive strength; unfaced; fabricated with shiplap or channel edges and with one side having grooved drainage channels.
   1. Products: Subject to compliance with Contract requirements, provide one of the following available products that may be incorporated into the Work:
      a. DiversiFoam Products; CertiFoam 40 Drainage Board.
      b. Dow Chemical Company (The); Perimate.
      c. Or an Approved Equal.

C. Geotextile-Faced Wall Insulation Drainage Panels: Extruded-polystyrene board insulation complying with ASTM C 578, Type VI, 40-psi minimum compressive strength; fabricated with tongue-and-groove edges and with one side having grooved drainage channels faced with a nonwoven, geotextile filter fabric.
   1. Products: Subject to compliance with Contract requirements, provide one of the following available products that may be incorporated into the Work:
      a. Owens Corning; Insul-Drain.
      b. T. Clear Corporation; Thermadry 1250.
      c. Or an Approved Equal.

D. Unfaced Plaza Deck Insulation Drainage Panels: Extruded-polystyrene board insulation complying with ASTM C 578, Type VI, 40-psi minimum compressive strength; unfaced; fabricated with shiplapped or channel edges and with one side having ribbed drainage channels.
   1. Products: Subject to compliance with Contract requirements, provide one of the following available products that may be incorporated into the Work:
      a. DiversiFoam Products; CertiFoam Plaza Deck.
      b. Dow Chemical Company (The); Styrofoam Ribbed Roofmate.
      c. Owens Corning; Foamular 604 RB.
      d. Or an Approved Equal.

E. Geotextile-Faced Plaza Deck Insulation Drainage Panels: Extruded-polystyrene board insulation complying with ASTM C 578, Type VII, 60-psi minimum compressive strength; fabricated with tongue-and-groove edges and with one side having grooved drainage channels faced with a nonwoven, geotextile filter fabric.
   1. Products: Subject to compliance with Contract requirements, provide one of the following

available products that may be incorporated into the Work:
a. T. Clear Corporation; Thermadry 1750.
b. Or an Approved Equal.

2.7 PLAZA DECK PAVERS

A. Plaza Deck Pavers: Concrete, and or Asphalt-block pavers specified in Division 32 Section "Unit Paving."

B. Plaza Deck Pavers: Granite, Limestone, Marble, and or Slate pavers specified in Division 09 Section "Stone Flooring."

C. Plaza Deck Pavers: Heavyweight, hydraulically pressed, concrete units, square edged with top edges beveled 3/16 inch, manufactured for use as plaza deck pavers; minimum compressive strength 7500 psi, ASTM C 140; absorption not greater than 5 percent, ASTM C 140; no breakage and maximum 1 percent mass loss when tested for freeze-thaw resistance according to ASTM C 67.
1. Manufacturers: Subject to compliance with Contract requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work:
   a. Hanover Architectural Products.
   b. Hastings Pavement Company, LLC.
   c. Roofblok Limited.
   d. Sunny Brook Pressed Concrete.
   e. Wausau Tile, Inc.; Terra-Paving Division.
   f. Westile Roofing Products.
   g. Or an Approved Equal.
2. Thickness: 1-5/8 inches- 2 inches.
3. Face Size: 8-7/8 inches square, 9 inches square, 9 by 18 inches, 12 inches, 12 by 24 inches, 18 inches square, 24 inches square or as indicated on the contract drawings.
4. Color: As selected by Architect from manufacturer's full range.

D. Setting Bed: Provide aggregate, mortar or bituminous setting-bed materials specified in Division 32 Section "Unit Paving."

E. Paver Supports: Paver manufacturer's standard SBR rubber, high-density polyethylene, or polyurethane paver support assembly, including adjustable or stackable pedestals, shims, and spacer tabs for joint spacing of 1/8-inch, 3/16 inch, 1/8 to 3/16 inch.
1. Concrete Fill: ACI 301, compressive strength of 5000 psi at 28 days, and air content of 6 percent.

PART 3- EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with Contract requirements for installation tolerances and other conditions affecting performance of the Work.
1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.

2. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

B. Proceed with installation only after verification of the above-mentioned conditions for concrete and substrate.

3.2 PREPARATION

A. Clean and prepare substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.

D. Remove grease, oil, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
1. Abrasive blast clean concrete surfaces uniformly to expose top surface of fine aggregate according to ASTM D 4259 with a self-contained, recirculating, blast-cleaning apparatus. Remove material to provide a sound surface free of laitance, glaze, efflorescence, curing compounds, concrete hardeners, or form-release agents. Remove remaining loose material and clean surfaces according to ASTM D 4258.

E. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.

3.3 JOINTS, CRACKS, AND TERMINATIONS

A. Prepare and treat substrates to receive waterproofing membrane, including joints and cracks, deck drains, corners, and penetrations according to manufacturer's written instructions.
1. Rout and fill joints and cracks in substrate. Before filling, remove dust and dirt according to ASTM D 4258.
2. Adhere strip of elastomeric sheet to substrate in a layer of hot rubberized asphalt. Extend elastomeric sheet a minimum of 6 inches on each side of moving joints and cracks or joints and cracks exceeding 1/8-inch-thick, and beyond deck drains and penetrations. Apply second layer of hot fluid-applied, rubberized asphalt over elastomeric sheet.
3. Embed strip of reinforcing fabric into a layer of hot rubberized asphalt. Extend reinforcing fabric a minimum of 6 inches on each side of nonmoving joints and cracks not exceeding 1/8-inch-thick, and beyond roof drains and penetrations. Retain subparagraph below with fabric-reinforced joints for unreinforced waterproofing membrane. Apply second layer of hot fluid-applied, rubberized asphalt over reinforcing fabric.

B. At expansion joints and discontinuous deck-to-wall or deck-to-deck joints, bridge joints with elastomeric sheet extended a minimum of 6 inches on each side of joints and adhere to substrates in a layer of hot rubberized asphalt. Apply second layer of hot fluid-applied, rubberized asphalt over elastomeric sheet.

3.4 FLASHING INSTALLATION

A. Install elastomeric flashing sheets at terminations of waterproofing membrane according to manufacturer's written instructions.

B. Prime substrate with asphalt primer.

C. Install elastomeric flashing sheet and adhere to deck and wall substrates in a layer of hot rubberized asphalt.

D. Extend elastomeric flashing sheet up walls or parapets a minimum of 8 inches above plaza deck pavers and 6 inches onto deck to be waterproofed.

E. Install termination bars and mechanically fasten to top of elastomeric flashing sheet at terminations and perimeter of roofing.

3.5 MEMBRANE APPLICATION

A. Apply primer, at manufacturer's recommended rate, over prepared substrate and allow to dry.

B. Heat and apply rubberized asphalt according to manufacturer's written instructions.
   1. Heat rubberized asphalt in an oil- or air-jacketed melter with mechanical agitator specifically designed for heating rubberized asphalt.

C. Start application with manufacturer's authorized representative present.

D. Unreinforced Membrane: Apply hot rubberized asphalt to substrates and adjoining surfaces indicated. Spread to form a uniform, unreinforced, seamless membrane, 180-mil minimum thickness, but not less than 125 mil thick.

E. Reinforced Membrane: Apply hot rubberized asphalt to substrates and adjoining surfaces indicated. Spread to a thickness of 90 mils; embed reinforcing fabric, overlapping sheets 2 inches; spread another 125-mil-thick layer to provide a uniform, reinforced, seamless membrane 215 mils thick.

F. Apply waterproofing over prepared joints and up wall terminations and vertical surfaces to heights indicated or required by manufacturer.

G. Cover waterproofing with protection course with overlapped joints before membrane is subject to construction.

3.6 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate according to manufacturer's written instructions. Use methods that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

1. For vertical applications, install board insulation and protection course before installing drainage panels.

3.7 INSULATION INSTALLATION

A. Install one or more layers of board insulation to achieve required thickness and insulation drainage panels over waterproofed surfaces. Cut and fit to within 3/4 inch of projections and penetrations.

B. On vertical surfaces, set insulation units into rubberized asphalt according to manufacturer's written instructions.

C. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.8 PLAZA DECK PAVER INSTALLATION

A. Setting Bed: Install setting bed in locations and of thickness indicated to comply with requirements in Division 32 Section "Unit Paving." Install concrete pavers in locations indicated according to manufacturer's written instructions.

B. Accurately install adjustable-height paver pedestals and accessories in locations and to elevations required. Adjust for final level and slope with shims.
   1. Fill paver pedestal with concrete mix, strike smooth with top of pedestal, and cure according to ACI 301.

C. Loosely lay pavers on pedestals, maintaining a uniform open joint width. Tightly seat pavers against spacers to eliminate lateral movement or drift of paving assembly. Align joint patterns parallel in each direction.
   1. Lay out pavers to avoid less-than-half-width pavers at perimeter or other terminations.

D. Install pavers to not vary more than 1/16 inch in elevation between adjacent pavers or more than 1/16 inch from surface plane elevation of individual paver.

E. Maintain tolerances of paving installation within 1/4 inch in 10 feet of surface plane in any direction.

3.9 FIELD QUALITY CONTROL

A. Engage a full-time site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions; surface preparation; and application of the membrane, flashings, protection, and drainage components; furnish daily reports to Architect.

B. Flood Testing: Flood test each deck area for leaks, according to recommendations in ASTM D 5957, after completing and protecting waterproofing but before overlaying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
   1. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches. Maintain 2 inches of clearance from top of sheet flashings.

2. Flood each area for 48 hours.

3. After flood testing, repair leaks, repeat flood tests, and make further repairs until waterproofing installation is watertight.

C. Engage an independent testing agency to observe flood testing and examine underside of decks and terminations for evidence of leaks during flood testing.

3.10 CLEANING AND PROTECTION

A. Protect waterproofing from damage and wear during remainder of construction period.

B. Protect installed board insulation and insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation cannot be concealed and protected by permanent construction immediately after installation.

C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.11 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

B. Above unit prices include all required surface.

END OF SECTION 071413

SECTION 071416
COLD FLUID-APPLIED WATERPROOFING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Contract Documents apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Single-component polyurethane waterproofing.
2. Two-component polyurethane waterproofing.
3. Polyester waterproofing.
4. Latex-rubber waterproofing.
5. Molded-sheet drainage panels.
6. Insulation.
7. Plaza deck pavers.

B. Related Section:
1. Division 07 Section "Joint Sealants" for joint-sealant materials and installation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
1. Include setting drawings showing layout, sizes, sections, profiles, and joint details of pedestal-supported concrete pavers.

C. Samples: For the following products:
1. Flashing sheet, 10 by 8 inches.
2. Membrane-reinforcing fabric, 10 by 8 inches.
3. Insulation, 10 by 8 inches.
4. Drainage panel, 6 by 6 inches.
5. Plaza deck paver, 6 by 6 inches in each color and texture required.
6. Paver pedestal assembly.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For waterproofing, based on evaluation of comprehensive tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that is approved or licensed by waterproofing manufacturer for installation of waterproofing required for this Project.

B. Source Limitations: Obtain waterproofing materials, protection course and molded-sheet drainage panels from single source from single manufacturer.

C. Mockups: Before beginning installation, install waterproofing to 100 sq. ft. of deck or wall to demonstrate surface preparation, crack and joint treatment, corner treatment, thickness, texture, and execution quality. Install pavers and pavers supports to demonstrate aesthetic effects and set quality standards for materials and execution.

1. If Architect determines mockups do not comply with requirements, reapply waterproofing and reinstall overlaying construction until mockups are approved.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Preinstallation Conference: Conduct conference at DCAS multiple sites.

1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver liquid materials to Project site in original containers with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, shelf life, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer.

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

D. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS.

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.
   1. Do not apply waterproofing in snow, rain, fog or mist, or when such weather conditions are imminent during application and curing period.

B. Maintain adequate ventilation during application and curing of waterproofing materials.

1.8 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form in which waterproofing manufacturer agree to repair or replace waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.
   1. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate that exceed 1/16 inch in width.
   2. Warranty Period: Twenty-Five years from date of Substantial Completion.

B. Special Installer's Warranty: Specified form date of Substantial Completion, signed by Installer, covering Work of this Section, for warranty period of two years.
   1. Warranty includes removing and reinstalling protection board, drainage panels, insulation, pedestals, and pavers on plaza decks.

PART 2 – PRODUCTS

2.1 SINGLE-COMPONENT POLYURETHANE WATERPROOFING

A. Single-Component, Modified Polyurethane Waterproofing: Comply with ASTM C 836 and with manufacturer's written physical requirements.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. American Permaquik Inc.; PQ 6800.
      b. Anti-Hydro International, Inc.; A-H Seamless Membrane.
      c. Carlisle Coatings & Waterproofing Inc.; CCW-525.
      d. CETCO; LDC 60.
      e. Degussa Building Systems; HLM 5000.
      f. Karnak Corporation; One-Kote System.
      g. Meadows, W.R., Inc.; Sealtight Meadow-Pruf Seamless
      h. Mer-Kote Products, Inc.; Mer-Thane 320.
      i. Neogard, Div. of Jones-Blair; Neogard 7401.
      j. Pacific Polymers International, Inc.; Elasto-Deck B.T. or Elasto-Deck B.T. 100% Solids Elasto-Deck B.T. H20.
      k. Tremco Incorporated; Tremproof 60, Vulkem 250 GC, or Vulkem 201.
      l. United Coatings; Elastall 1000.

m. Or Approve Equal.

B. Single-Component, Reinforced, Modified Polyurethane Waterproofing: Comply with ASTM C 836 and with manufacturer's written physical requirements.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Carlisle Coatings & Waterproofing Inc.; CCW-525-H.
b. Siplast; PMMA liquid-applied, SBS-Modified Bitumen, STP
c. Soprema; Colphene line
d. Or Approved Equal.

C. Single-Component, Unmodified Polyurethane Waterproofing: Comply with ASTM C 836 and with manufacturer's written physical requirements.

1. Products: Subject to compliance with requirements, provide one of the following:

a. 3M; Scotch Clad 5893/5864.
b. Tremco Incorporated; Vulkem 101.
c. Or Approved Equal.

2.2 TWO-COMPONENT POLYURETHANE WATERPROOFING

A. Two-Component, Modified Polyurethane Waterproofing: Comply with ASTM C 836 and with manufacturer's written physical requirements.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Gaco Western Inc.; LM-60.
b. Tremco Incorporated; Vulkem 222.
c. Or Approved Equal

B. Two-Component, Unmodified Polyurethane Waterproofing: Comply with ASTM C 836 and with manufacturer's written physical requirements.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Carlisle Coatings & Waterproofing Inc.; CCW 703 Liquiseal.
b. Pacific Polymers International, Inc.; Elasto-Deck B.T. 1000, Elasto-Deck B.T. Two-Component.
c. 3M; FC 100.
d. Tremco Incorporated; Vulkem 102.
e. Or Approved Equal.

C. Two-Component, Reinforced, Unmodified Polyurethane Waterproofing: Comply with ASTM C 836 and with manufacturer's written physical requirements.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Kemper System, Inc.; Kemperol 2K-PUR.
b. Or Approved Equal.

2.3 POLYESTER WATERPROOFING

A. Two-Component, Reinforced, Unsaturated Polyester Waterproofing: Comply with ASTM C 836 and with manufacturer's written physical requirements.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Kemper System, Inc.; Kemperol BR.
   b. Landmark Products, Inc.; Triflex D.
   c. Or Approved Equal.

2.4 LATEX-RUBBER WATERPROOFING

A. Two-Component, Unreinforced, Latex-Rubber Waterproofing: Comply with ASTM C 836 and with manufacturer's written physical requirements.
   1. Products: Subject to compliance with requirements, provide the following:
      a. Grace, W. R. & Co.; Procor.
      b. Or Approved Equal.

B. Two-Component, Reinforced, Latex-Rubber Waterproofing: Comply with ASTM C 836 and with manufacturer's written physical requirements.
   1. Products: Subject to compliance with requirements, provide the following:
      a. Grace, W. R. & Co.; Procor Deck System 3R.
      b. Or Approved Equal.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials recommended by manufacturer to be compatible with one another and with waterproofing, as demonstrated by waterproofing manufacturer, based on testing and field experience.

B. Primer: Manufacturer's standard, factory-formulated polyurethane or epoxy primer.

C. Sheet Flashing: 50-mil minimum, nonstaining, uncured sheet neoprene.
   1. Adhesive: Manufacturer's recommended contact adhesive.

D. Membrane-Reinforcing Fabric: Nonwoven, needle-punched white polyester fabric, 6-oz./sq. yd. manufacturer's standard weight.

E. Joint Reinforcing Strip: Manufacturer's recommended fiberglass mesh or polyester fabric.

F. Joint Sealant: Multicomponent polyurethane sealant, compatible with waterproofing, complying with ASTM C 920 Type M, Class 25; Grade NS for sloping and vertical applications or Grade P for deck applications; Use NT exposure; and as recommended by manufacturer for substrate and joint conditions.
   1. Backer Rod: Closed-cell polyethylene foam.

2.6 PROTECTION COURSE

A. Protection Course: ASTM D 6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:
   1. Thickness: 1/4 inch, nominal.
   2. Thickness: 1/8 inch, nominal, for vertical applications; 1/4 inch, nominal, elsewhere.
   3. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for type of protection course.

B. Protection Course: Fan folded, with a core of extruded-polystyrene board insulation faced one or both side(s) with plastic film, nominal thickness of 1/4 inch, with compressive strength not less than 8 psi per ASTM D 1621 and maximum water absorption by volume of 0.6 percent per ASTM C 272.

C. Protection Course: Unfaced, fan-folded, rigid, extruded-polystyrene board insulation; nominal thickness of 1/4 inch with compressive strength of not less than 8 psi per ASTM D 1621.

D. Protection Course: Fan folded, with a core of molded-polystyrene board insulation faced both sides with plastic film, nominal thickness of 1/2 inch, with compressive strength not less than 12 psi per ASTM D 1621 and water absorption by volume of less than 1 percent per ASTM C 272.

E. Protection Course: Unfaced, extruded-polystyrene board insulation; ASTM C 578, Type X, 1/2 inch thick.

F. Protection Course: Molded-polystyrene board insulation, ASTM C 578, Type I, 0.90-lb/cu. ft. minimum density, 1-inch minimum thickness.

2.7 MOLDED-SHEET DRAINAGE PANELS

A. Molded-Sheet Drainage Panel: Comply with Division 33 Section "Subdrainage."

B. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 sieve laminated to one side with a polymeric film bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a vertical flow rate of 9 to 15 gpm per ft.

C. Woven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a woven-geotextile facing with an apparent opening size not exceeding No. 40 sieve, laminated to one side with a polymeric film bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a horizontal flow rate not less than 2.8 gpm per ft.

2.8 INSULATION

A. Board Insulation: Extruded-polystyrene board insulation complying with ASTM C 578, square or shiplap edged.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. DiversiFoam Products.
      b. Dow Chemical Company (The).
      c. Owens Corning.
      d. Pactiv Corporation.
      e. T. Clear Corporation.
      f. Or Approved Equal.
   2. Type IV, 25-psi minimum compressive strength.
   3. Type VI, 40-psi minimum compressive strength.
   4. Type VII, 60-psi minimum compressive strength.
   5. Type V, 100-psi minimum compressive strength.

B. Unfaced, Wall Insulation Drainage Panels: Extruded-polystyrene board insulation complying with ASTM C 578, Type IV, 25-psi or Type VI, 40-psi minimum compressive strength; unfaced; fabricated

with shiplap or channel edges and with one side having grooved drainage channels.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. DiversiFoam Products; CertiFoam 40 Drainage Board.
    b. Dow Chemical Company (The); Perimate.
    c. Pactiv Corporation; Green-Guard-DC.
    d. Or Approved Equal.

C. Geotextile-Faced, Wall Insulation Drainage Panels: Extruded-polystyrene board insulation complying with ASTM C 578, Type VI, 40-psi minimum compressive strength; fabricated with tongue-and-groove edges and with one side having grooved drainage channels faced with a nonwoven-geotextile filter fabric.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Owens Corning; Insul-Drain.
    b. T. Clear Corporation; Thermadry 750 and 1250.
    c. Or Approved Equal.

D. Unfaced, Plaza Deck, Insulation Drainage Panels: Extruded-polystyrene board insulation complying with ASTM C 578, Type VII, 60-psi minimum compressive strength; unfaced; fabricated with ship lapped or channel edges and with one side having ribbed drainage channels.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. DiversiFoam Products; CertiFoam Plaza Deck.
    b. Dow Chemical Company (The); Styrofoam Ribbed Roofmate.
    c. Owens Corning; Foamular 404 RB and Foamular 604 RB.
    d. Or Approved Equal.

E. Geotextile-Faced, Plaza Deck, Insulation Drainage Panels: Extruded-polystyrene board insulation complying with ASTM C 578, Type VII, 60-psi minimum compressive strength; fabricated with tongue-and-groove edges and with one side having grooved drainage channels faced with manufacturer's standard, nonwoven-geotextile filter fabric.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. T. Clear Corporation; Thermadry 1750.
    b. Acme.
    c. Owens Corning
    d. Or Approved Equal.

2.9 PLAZA DECK PAVERS

A. Plaza Deck Pavers: Brick, Concrete, Asphalt-block pavers specified in Division 32 Section "Unit Paving."

B. Plaza Deck Pavers: Granite, Limestone, Marble, Quartz-based stone and Slate pavers specified in Division 09 Section "Stone Flooring."

C. Plaza Deck Pavers: Heavyweight, hydraulically pressed, concrete units, with top edges beveled 3/16

inch, manufactured for use as plaza deck pavers; minimum compressive strength of 6500 psi, ASTM C 140; absorption not greater than 5 percent, ASTM C 140; no breakage and maximum 1 percent mass loss when tested for freeze-thaw resistance according to ASTM C 67.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Hanover Architectural Products.
   b. Hastings Pavement Company, LLC.
   c. Roofblok Ltd.
   d. Sunny Brook Pressed Concrete Co.
   e. Wausau Tile, Inc.; Terra-Paving Div.
   f. Westile Roofing Products.
   g. Or Approved Equal.
3. Thickness: 1-5/8 inches, 1-3/4 inches, 2 inches, and 2-3/8 inches.
4. Face Size: 9-by-18 inches, 12 inches square, 12-by-24 inches, 18 inches square, and 24 inches square or as indicated on drawings.
5. Color: As selected by Architect from manufacturer's full range.

D. Setting Bed: Provide aggregate, mortar, and bituminous setting-bed materials specified on drawings.

E. Paver Pedestals: Paver manufacturer's standard SBR rubber, high-density polyethylene, or polyurethane paver support assembly, including fixed-height, adjustable or stackable pedestals, shims, and spacer tabs for joint spacing of 1/8 to 3/16 inch.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. TileTech Paver System.
   b. Skydeck ASA, Skyjack Pedestals.
   c. Archtrack Pedestal Support Systems
   d. Plaza Concepts Pedestals
   e. Or Approved Equal.
3. Concrete Fill: ACI 301, compressive strength of 4000 psi at 28 days and air content of 6 percent.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
2. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean and prepare substrate according to manufacturer's written recommendations. Provide clean, dust-free, and dry substrate for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage or overspray affecting other construction.

C. Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.

D. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, acid residues, and other penetrating contaminants or film-forming coatings from concrete.
   1. Abrasive blast clean concrete surfaces uniformly to expose top surface of fine aggregate according to ASTM D 4259 with a self-contained, recirculating, blast-cleaning apparatus. Remove material to provide a sound surface free of laitance, glaze, efflorescence, curing compounds, concrete hardeners, or form-release agents. Remove remaining loose material and clean surfaces according to ASTM D 4258.

E. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.

3.3 PREPARATION AT TERMINATIONS AND PENETRATIONS

A. Prepare vertical and horizontal surfaces at terminations and penetrations through waterproofing and at expansion joints, drains, and sleeves according to ASTM C 898, ASTM C 1471 and manufacturer's written instructions.

B. Prime substrate unless otherwise instructed by waterproofing manufacturer.

C. Apply waterproofing in two separate applications and embed a joint reinforcing strip in the first preparation coat when recommended by waterproofing manufacturer.
   1. Provide sealant cants around penetrations and at inside corners of deck-to-wall butt joints when recommended by waterproofing manufacturer.

3.4 JOINT AND CRACK TREATMENT

A. Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 898, ASTM C 1471 and waterproofing manufacturer's written instructions. Remove dust and dirt from joints and cracks, complying with ASTM D 4258, before coating surfaces.
   1. Comply with ASTM C 1193 for joint-sealant installation.
   2. Apply bond breaker between sealant and preparation strip.
   3. Prime substrate and apply a single thickness of preparation strip extending a minimum of 3 inches along each side of joint. Apply waterproofing in two separate applications and embed a joint reinforcing strip in the first preparation coat.

B. Install sheet flashing and bond to deck and wall substrates where indicated or required according to waterproofing manufacturer's written instructions.
   1. Extend sheet flashings onto perpendicular surfaces and other work penetrating substrate

according to ASTM C 898.

3.5 WATERPROOFING APPLICATION

A. Apply waterproofing according to ASTM C 898, ASTM C 1471 and manufacturer's written instructions.

B. Start installing waterproofing in presence of manufacturer's technical representative.

C. Apply primer over prepared substrate.

D. Unreinforced Waterproofing Applications: Mix materials and apply waterproofing by spray, roller, notched squeegee, trowel, or other application method suitable to slope of substrate.
   1. Apply one or more coats of waterproofing to obtain a seamless membrane free of entrapped gases, with an average dry film thickness of 60 mils and a minimum dry film thickness of 50 mils at any point.
   2. Apply waterproofing to prepared wall terminations and vertical surfaces.
   3. Verify wet film thickness of waterproofing every 100 sq. ft.

E. Reinforced Waterproofing Applications: Mix materials and apply waterproofing by roller, notched squeegee, trowel, or other suitable application method.
   1. Apply first coat of waterproofing, embed membrane-reinforcing fabric, and apply second coat of waterproofing to completely saturate reinforcing fabric and to obtain a seamless reinforced membrane free of entrapped gases, with an average dry film total thickness of 70 mils.
   2. Apply reinforced waterproofing to prepared wall terminations and vertical surfaces.
   3. Verify wet film thickness of waterproofing every 100 sq. ft.

F. Install protection course with butted joints over nominally cured membrane before starting subsequent construction operations.
   1. Molded-sheet drainage panels, Insulation drainage panels or Board insulation may be used in place of a separate protection course to vertical applications when approved by waterproofing manufacturer.

3.6 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesives or mechanical fasteners that do not penetrate waterproofing. Lap edges and ends of geotextile fabric to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.
   1. For vertical applications, install board insulation or protection course before installing drainage panels.

3.7 INSULATION INSTALLATION

A. Install one or more layers of board insulation to achieve required thickness or insulation drainage panels over waterproofed surfaces. Cut and fit to within 3/4 inch of projections and penetrations.

B. On vertical surfaces, set insulation units in adhesive applied according to manufacturer's written

instructions. Use type of adhesive recommended in writing by insulation manufacturer.

C. On horizontal surfaces, place insulation units unadhered according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.8 PLAZA DECK PAVER INSTALLATION

A. Setting Bed: Install setting bed in locations and of thickness indicated to comply with requirements in Division 32 Section "Unit Paving." And Division 09 Section "Stone Flooring."

B. Install concrete pavers, in locations indicated, according to manufacturer's written instructions.

C. Accurately install fixed or adjustable-height paver pedestals in locations and to elevations required. Adjust for final level and slope with shims.
   1. Fill paver pedestal with concrete mix, strike smooth with top of pedestal, and cure according to ACI 301.

D. Loosely lay pavers on pedestals, maintaining a uniform open joint width. Tightly seat pavers against spacers to eliminate lateral movement or drift of paving assembly. Align joint patterns parallel in each direction.

E. Lay out pavers to avoid less-than-half-width pavers at perimeter or other terminations.

F. Install pavers to not vary more than 1/16 inch in elevation between adjacent pavers or more than 1/16 inch from surface plane elevation of individual paver.

G. Maintain tolerances of paving installation within 1/4 inch in 10 feet of surface plane in any direction.

3.9 FIELD QUALITY CONTROL

A. Engage a full-time site representative qualified by the waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, and application of the membrane, flashings, protection, and drainage components; and to furnish daily reports to Architect.

B. Flood Testing: Flood test each deck area for leaks, according to recommendations in ASTM D 5957, after completing waterproofing but before overlaying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
   1. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches. Maintain 2 inches of clearance from top of sheet flashings.
   2. Flood each area for 24 or 48 hours as determined by design architect.
   3. After flood testing, repair leaks, repeat flood tests, and make further repairs until waterproofing installation is watertight.

C. DCAS can request from the contractor to Engage an independent testing agency to observe flood testing and examine underside of decks and terminations for evidence of leaks during flood testing.

3.10 CURING, PROTECTION, AND CLEANING

A. Cure waterproofing according to manufacturer's written recommendations, taking care to prevent contamination and damage during application stages and curing.
   1. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Protect installed board insulation and insulation drainage panels from damage due to ultraviolet light, harmful weather exposures, physical abuse, and other causes. Immediately after installation, provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071416

SECTION 072100
THERMAL INSULATION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. The Work of this Section, as shown or specified, shall be performed in accordance with the requirements of the Contract Documents, including but not limited to the Contract Drawings, Schedules, Bidding Requirements, General and Supplemental Conditions and General Requirements of the Contract.

1.2 SECTION INCLUDES

A. The Work of this Section includes all labor, materials, equipment, and services necessary to complete the building insulation as shown on the drawings and/ or specified herein, including but not limited to, the following:
   1. Glass-fiber blanket insulation
   2. Rigid board thermal insulation
   3. Attachment devices.

1.3 RELATED SECTIONS

A. Section 042000 “Unit Masonry”
B. Section 092900 “Gypsum Drywall”

1.4 REFERENCES

A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.

1.5 SYSTEM DESCRIPTON

A. Performance Requirements:
1. Fire Resistive Rating: Identify materials with appropriate markings of applicable testing and inspecting agency.
   a. Where materials are required by law or are specified to have a fire resistive rating, provide materials, accessories and application procedures which have been listed by UL or tested according to ASTM E814/UL 1479 to achieve the rating required.
   b. Surface-Burning Characteristics: ASTM E84. Where specified or required provide the following maximum flame spread and smoke developed ratings when materials are tested in accordance with ASTM E84:
      1. Unfaced material will have a maximum flame spread and smoke-developed of 0.
      2. Faced material will have maximum flame spread and smoke-developed of 25 and

0 respectively.

c. Combustibility: Glass, slag-wool-fiber/rock-wool-fiber insulations shall be rated as noncombustible as defined by NFPA standard 220 when tested in accordance with ASTM E136.

d. Rated Curtain Wall Exterior Assemblies: Where curtain wall and safing insulation are required for rated curtain wall assemblies, provide curtain wall insulation, safing insulation and smoke seals tested in accordance with ASTM E2307 "Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale Multi-Story Test Apparatus"

B. Plenum Rating: Provide glass, slag-wool-fiber/rock-wool-fiber insulation where indicated in ceiling plenums whose test performance is rated as follows for use in plenums as determined by testing identical products per "Erosion Test" and "Mold Growth and Humidity Test" described in UL 181, or on comparable tests from another standard acceptable to authorities having jurisdiction.
   1. Erosion Test Results: Insulation shows no visible evidence of cracking, flaking, peeling, or delamination of interior surface of duct assembly, after testing for 4 hours at 2500 fpm air velocity.
   2. Mold Growth and Humidity Test Results: Insulation shows no evidence of mold growth, delamination, or other deterioration due to the effects of high humidity, after inoculation with Chaetomium globosium on all surfaces and storing for 60 days at 100% relative humidity in the dark.
   3. Unfaced fiberglass batt insulation shall not be used above suspended ceilings. If used in plenums and shafts, fiberglass batt insulation must be encapsulated and formaldehyde-free. Fiberglass board products used in plenums shafts or for insulating ductwork must be wrapped or enclosed.

1.6 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract instructions and general recommendations for the resinous flooring specified herein.

B. Product Data: Submit for Consultant’s action. Submit manufacturer’s literature specifications, and installation instructions describing the general properties of each material and accessory to be used in the Work.

1.7 QUALITY ASSURANCE

A. Basis of Design: When manufacturers’ materials, products or processes are specified for an item of Work, any one thereof is acceptable for the Subcontractor to choose. An alternative material, product or process will be considered if the Subcontractor submits a written substitution request together with such information as may be necessary to assist the Consultant in determining whether the proposed substitution is acceptable, the burden of proof rests solely upon the Subcontractor.

B. Sole-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products complying with requirements indicated without delaying the Work.

C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from authorities having jurisdiction.

D. Fiberglass insulation shall contain a minimum of 20% (by weight) recycled content, calculated by adding the post-consumer recycled content percentage to one-half of the post-industrial recycled content percentage.

E. Mineral wool insulation shall contain a minimum of 75% (by weight) recycled content, calculated

by adding the post-consumer recycled content percentage to one-half of the post-industrial recycled content percentage.

F. Extruded polystyrene insulation shall contain a minimum of 5% (by weight) recycled content, calculated by adding the post-consumer recycled content percentage to one-half of the post-industrial recycled content percentage.

G. To the greatest extend possible, the Contractor shall use extruded polystyrene insulation products that do not utilize chlorine-based gases in the production process.

H. Pre-Installation Conference: Prior to the start of the Work, meet at the Project site to review methods and sequence of building insulation installation, special details and conditions, standard of workmanship, quality control requirements, job organization and other pertinent topics related to the Work.

1.8 WARRANTY

A. General: Warranties and guaranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties and guaranties made by the Subcontractor under requirements of the Contract Documents.

1. Special Warranty: Upon completion of the work, provide the extruded polystyrene insulation manufacturer's fifteen (15) year warranty stating that the thermal resistance of the extruded polystyrene insulation will not vary more than 10% from its published value.

1.2 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling, and Unloading: Deliver insulation materials in manufacturer's unopened containers or packages, fully identified with trade name, type, class, and other identifying information.

B. Storage and Protection: Store above grade and protect from weather and damage. Do not allow insulation to become wet, soiled, or covered with ice or snow. Protect insulation from exposure to high temperatures, excessive exposure to sunlight, and contact with hot surfaces in excess of the safe temperature indicated by the manufacturer.

C. Extruded Polystyrene Insulation Exposure: Prohibit exposure of extruded polystyrene board insulation to sunlight except to extent necessary for period of installation and concealment. Always protect against ignition.

D. Take every precaution to prevent the insulation from becoming wet, cover with tarps or other weather/watertight sheet goods.

PART 2 PRODUCTS

2.1 GLASS-FIBER BLANKET INSULATION

A. Manufacturers: Subject to compliance with requirements available manufacturers offering

products that may be incorporated into the Work include, but are not limited to, the following.

B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame- spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

D. Polypropylene-Scrim-Kraft-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type II (non-reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier).

E. Kraft-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type II (non-reflective faced), Class C (faced surface not rated for flame propagation); Category 1 (membrane is a vapor barrier).

F. Reinforced-Foil-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil- scrim polyethylene.

G. Foil-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (reflective faced), Class B (faced surface with a flame-propagation resistance of 0.12 W/sq. cm); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil- scrim polyethylene.

H. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

I. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:
   1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
   2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.

2.2 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers.
      b. Gemco; Spindle Type.
      c. Or an Approved Equal.
   2. Plate: Perforated, galvanized carbon-steel sheet, 0.030-inch (0.762 mm) thick by 2 inches (50 mm) square.
   3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation indicated.

B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting

spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Gemco; 90-Degree Insulation Hangers.
   b. Or an Approved Equal.
2. Angle: Formed from 0.030-inch- (0.762-mm-) thick, perforated, galvanized carbon-steel sheet with each leg 2 inches (50 mm) square.
3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation indicated.

C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41- mm-) thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following.
      a. AGM Industries, Inc.
      b. Gemco
      c. Or an Approved Equal.
   2. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
      a. Crawl spaces.
      b. Ceiling plenums.
      c. Attic spaces
      d. Where indicated.

D. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of 1 inch (25 mm), 2 inches (50 mm), 3 inches (76 mm) or as indicated between face of insulation and substrate to which anchor is attached.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Gemco; Clutch Clip
      b. Or an Approved Equal.

E. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. AGM Industries, Inc.; TACTOO Adhesive
      b. Gemco; Tuff Bond Hanger Adhesive
      c. Or an Approved Equal.

2.3 MATERIALS

A. Provide flexible glass fiber blankets/batts equal to "Fiberglass Flame Spread 25 Insulation" as manufactured by Owens Corning or an Approved Equal made by Manville or Certainteed conforming to ASTM C 612, Type 1A or ASTM C 665, Type III, Class A, faced on one side with foil reinforced Kraft vapor retarder; maximum flame spread, and smoke developed indices 25 and

50 respectively.

B. Insulation shall have an R value of not less than 3.7/inch and shall be 3" thick unless otherwise noted on the drawings.

C. Provide rigid board insulation equal to “Thermax Sheathing” as manufactured by Dow or equal conforming to ASTM C1289, Type 1, Class 2, a rigid board insulation consisting of a glass-fiber infused polyisocyanurate foam core laminated between smooth reflective aluminum facers on both sides. or an Approved Equal.

2.4 ACCESSORIES

A. Adhesive for Bonding Insulation: Type recommended by insulation manufacturer and having fire resistance characteristics similar to that of the insulation.

B. Sealer and Tape: Type recommended by insulation manufacturer and having perm rating and fire resistance characteristics similar to that of the insulation.

C. Welded or Adhesively Attached Mechanical Fasteners: Zinc coated steel or nylon fasteners consisting of a perforated galvanized carbon steel plate and copper coated steel prongs or spindles and self-locking washer; length to suit depth of insulation shown; Where spindles will be exposed to human contact after installation, protect ends with capped self-locking washers; Provide one of the following:
1. "Tactoo Insul-Hangers" (AGM Industries, Inc.).
2. "Insulation Hangers" (Gemco).
3. “Stic-Klip Type N Fasteners” (Eckel Industries of Canada).
4. Or an Approved Equal

D Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space between face of insulation and substrate to which anchor is attached. Provide "Clutch Clip" (Gemco, Or an Approved Equal.

PART 3 EXECUTION

3.1 GENERAL

A. Manufacturer's Instructions: Prepare substrates, apply primers and apply the work of this Section, including components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance.

B. Markings: Manufacturer's identification tags or marks are not acceptable on surfaces where products are considered to be finish material. Evidence of patching after removal of tags or marks is not acceptable.

3.2 EXAMINATION

A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

B. Require Installer to examine substrates and conditions under which insulation work is to be performed. A satisfactory substrate is one that complies with requirements of the section in which substrate and related work is specified. Obtain Installer's written report listing conditions detrimental to performance of work in this section. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

C. Clean substrates of substances harmful to insulations or vapor retarders, including removal of projections which might puncture vapor retarders.

D. Close off openings in cavities to receive poured-in-place insulation, sufficiently to prevent escape of insulation. Provide bronze or stainless-steel screen (inside) where openings must be maintained for drainage or ventilation.

E. Prepare and prime surfaces as per manufacturers recommendations prior to application of spray on cellulose insulation.

F. All surfaces to receive thermal spray insulation shall be free of all petroleum-based greases and oils, loose mill scale, rust, poorly adhered paint and other foreign materials that could impair bonding to the surface.

G. Remove dust, dirt or foreign materials on surface to which the thermal spray insulation shall be applied, that could otherwise create a false bond or surface staining the product.

3.3 INSTALLATION

A. General
1. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
2. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
3. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
4. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.
5. Cooperate in the coordination and scheduling of the work of this section with the work of other sections so as not to delay job progress.
6. Install insulation in as large components as practical and to cover entire areas indicated on the drawings, closely butted together at sides and ends, and against walls, beams, etc. Neatly fit and cut insulation around all projections such as pipes, conduits, hangers and all other elements encountered in the field, which will result in complete coverage of the scheduled areas.
7. Extend insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with

placement.

8. Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
9. Seal joints between closed-cell (non-breathing) insulation units by applying mastic or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with mastic or sealant.
    a. Installation shall be installed in a full bed of waterproofing mastic. Edges of insulation shall be buttered.
10. Set vapor retarder faced units with vapor retarder to warm side of construction, except as otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.
    a. All joints in vapor barriers shall be sealed with 4" wide, foil faced duct tape to prevent vapor and air migration.
    b. Tape joints and ruptures in vapor retarder and seal each continuous area of insulation to surrounding construction to ensure air-tight installation.
11. Set reflective foil-faced units accurately with air space in front of foil as shown. Provide not less than 0.75" air space where possible.
12. Discard, all insulation which becomes damaged during the course of installation or is no longer in a physical condition to function for use intended and replace with new material.
13. Clean surfaces, on which adhesives are used to secure the insulation in place, of dirt, grime, grease, oil and other foreign materials to assure that the surfaces are properly prepared to accept the bond of the approved adhesives.
14. Exercise extreme care to avoid damage and soiling of faces on insulation units which will be exposed to view. Align joints accurately, with adjoining surfaces set flush.
15. Where insulation is impaled on stick clips, provide clips not less than 3" from corners or edges and not more than 12" o.c.
16. Comply with manufacturer's instructions for the particular conditions of installation in each case. If printed instructions are not available or do not apply to the project conditions, consult the manufacturer's technical representative for specific recommendations before proceeding with the work.
17. Apply a single layer of insulation to the required thickness, unless a double layer is required, to make up the total thickness shown.
18. Coordinate installation of the sprayed cellulose fiber with work of other trades.

B. Extent of Insulation: Extend insulation full thickness over entire area to be insulated. Install in single layer unless otherwise shown or recommended by manufacturer. Cut and fit insulation tightly around obstructions and against each other. Neatly finish insulation exposed to view without broken corners or open joints.

C. Installation of Insulation for Framed Construction: Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

D. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials.

E. Installation of Vapor Retarders: Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission.

Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

1. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.
2. Before installing vapor retarders, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
3. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.

F. Maintenance of Vapor Barrier: Maintain integrity of vapor barriers of insulation by taping and sealing joints, ruptures and edges of units adjoining other surfaces. Seal joints caused by pipes, conduits, electrical boxes and similar items penetrating vapor barriers to create an air-tight seal between penetrating objects and vapor barrier. Repair any tears or punctures in vapor retarders immediately before concealment by other work. Cover with tape or another layer of vapor barrier.

G. Metal Furring Strips: Apply furring members to rigid insulation at 24 in. on center. Use fasteners recommended by the furring strip manufacturer. Coordinate with the gypsum drywall applicator for location and spacing of furring strips, detailing of internal and external corners, openings and other areas of special consideration.

3.4 INSTALLATION OF BELOW-GRADE INSULATION

A. On vertical surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
   1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) 36 inches (915 mm) below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
   1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) 36 inches (915 mm) in from exterior walls.

3.5 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Glass-Fiber Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
   1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
   2. Place insulation in cavities formed by framing members to produce a friction fit between

edges of insulation and adjoining framing members.

3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
5. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
6. For wood-framed construction, install blankets according to ASTM C 1320 and as follows:
   a. With faced blankets having stapling flanges, secure insulation by inset, stapling flanges to sides of framing members.
   b. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over i.

3.6 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated. Extend insulation 48 inches (1219 mm) up either side of partitions.

3.7 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

3.8 INSULATION SCHEDULE

A. Insulation Type as specified: Unfaced, glass-fiber blanket insulation.

B. Insulation Type as specified: Faced, glass-fiber blanket insulation.

3.9 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

END OF SECTION 072100

SECTION 075100
REPAIR OF BUILT-UP ROOFING

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Contract Documents apply to this Section.

1.2 SUMMARY

A. Section Includes: This section includes guidance on making minor repairs to asphalt and built-up roofing membranes. Some problems include open lap joints, blisters, splits, holes, ridges, undulations, wrinkles, and cracks.

B. Work Included:
   1. Inspection of existing conditions, including inspection of the building interior for indications of water infiltration and inspection of existing roofing and flashings.
   2. Repair of existing built-up membrane roofing, flashing, sheet metal work, aggregate surfacing, and related work, complete, in accordance with the Contract Documents. The Work of this Section shall include but not be limited to the following:
      a. Patching of insulation.
      b. Patching built-up membrane roofing.
      c. Temporary covers for open substrate.
      d. Protection of adjacent roofing to remain.
      e. Cant strips and tapered edge strips in affected locations.
      f. Vapor retarder.
      g. Roof insulation.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM); www.astm.org

1.4 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" apply to Work of this Section.

B. Definitions:
   - **Asphalt**- A dark brown to black semi-solid hydrocarbon obtained from crude petroleum. See ASTM D 312-78.
   - **Asphalt cement**- Trowelable black asphaltic mastic used for flashing and roof repairs. Contains fiber additives to thicken the mixture so that it will not run-down vertical surfaces. Also called roofing cement, flashing cement, plastic asphalt cement, plastic cement, roofing tar, bitumen, and elastic cement.
   - **Bitumen**--A semisolid mixture of complex hydrocarbons derived from coal or petroleum, as coal-tar pitch or asphalt; before application, usually dissolved in a solvent, emulsified, or heated to a

liquid state.

- **Built-up roofing--**A continuous roof covering made up of laminations or plies of saturated or coated roofing felts, alternated with layers of asphalt or coal-tar pitch and surfaced with a layer of gravel or slag in a heavy coat of asphalt or coal-tar pitch or finished with a cap sheet; generally used on flat or low-pitched roofs.
- **Bituminous coating**--An asphalt or tar compound used to provide a protective finish for a surface.
- **Coal tar bitumen**--A dark brown to black, semi-solid hydrocarbon, a residue distillation of coal tar. It is used for the construction of low-pitch built-up roofs. It differs from coal tar pitch because of a different volatility. See ASTM D, 450, Type III.
- **Coal tar pitch**--Similar to coal tar bitumen. Used for dead-level or low-slope built-up roofs. See ASTM D 450, Type I.
- **Lap cement**--Thinner than asphalt cement, this is used to make watertight joints at the laps of roll-roofing.
- **Roof restorant**--The restorant penetrates the existing roofing felts and plasticizes the age hardened bitumen to its originally installed state. It will not, however, stop or seal leaks. In addition, a deep coating on the surface provides a weathering surface and a binder for the replacement aggregate. Also called roof coating or roof paint.

1.5 CONDITION IDENTIFICATION:

A. Ridges:
1. Note that ridges should be repaired as soon as possible. Continual stress on a ridge can lead to splitting of the material.
2. Ridges are firm and do not yield under pressure. They may result from the substrate being uneven before the felt was laid, or from moisture distorting the substrate.
3. Ridging usually occurs over or near joints between boards. The ridges expand as entrapped moisture vaporizes. Ridges become a problem when they interfere with drainage or when the roof begins to leak.

B. Undulations:
1. Unlike ridging, undulations will yield to pressure.
2. Distortions of felts may result from the way the rolls were stored (flat instead of on end), inadequate pressure applied while laying, poor application of bitumen compound, or if entrapped moisture becomes vaporized.

C. Blisters:
1. Blisters will yield to pressure.
2. Blisters begin with the expansion of trapped air and/ or moisture pockets and can result from inadequate pressure during laying.
3. Full Membrane Blistering: Usually occurs when no separating layer is provided between the asphalt and the substrate.
4. Inter-layer Blistering:
5. When large blisters result from additional air and water drawn in from outside through the top layer of the felt.
6. Not a common problem but can result if the 2nd layer does not adhere well to the 1st layer due to the accumulation of dirt or dust.
   -OR-
7. If a blow develops in the 1st layer, the 2nd layer become thin at that point and allow air

and moisture to penetrate between the layers. This can create the potential for a blister to develop.

8. A blister usually develops under the cap sheet of the membrane.
9. Inter-layer blistering is most common with unsurfaced or mineral surfaced felts on vertical or sloping surfaces. However, high performance membranes can reduce the incidence of this occurring.

D. Top Pitting:
   1. Note: no remedial treatment is recommended, as this type of blistering should not affect the efficiency of the waterproofing.
   2. Miniature surface blistering of the bitumen coating (especially with BS747 Type 1E and 2E mineral-surfaced felts).
   3. The blisters may range in size from 1mm to 3mm.
   4. Top pitting may be caused by:
      a. Trapped air and/ or moisture in the manufacture of the material.
      b. Oliensis: Incompatibility of the saturating bitumen with the coating bitumen (i.e. oils from the coating separate as an incompatible reaction with the saturant bitumen).
      c. If numerous across the surface, the coating may separate from the membrane and result in a loss of surfacing.

E. Cockling:
   1. Rounded ridging usually in line with the length of the material.
   2. Cockles sometimes develop because of thermal expansion (especially with Polyester felts, which are heat sensitive). The heat from the bonding bitumen during application can create minor wrinkling or cockles which usually disappears as the material settles.
   3. Most common in fiber and asbestos base felts as they tend to expand when their moisture content increases.
   4. Cockling is less likely in coated felts especially those with a glass or polyester base.

F. Blowing:
   1. Blows are bubbles that develop on the surface from gas moving through the asphalt. The heat of the asphalt during application causes the air to expand and creates steam by raising the temperature of the moisture.
   2. Where there is no separating layer between the asphalt and the substrate.

1.6 SUBMITTALS

A. Inspection Report: Written inspection report including drawings indicating all locations to be repaired and repair method for each location.

B. Product Data: Submit manufacturer’s catalog cuts and pertinent accompanying technical data, for each type of product.

C. Samples: Samples shall include the following:
   1. Metal flashing: 6” lengths.
   2. Rigid roof insulation: 8” x 12”, each kind.
   3. Aggregate: 5 lb. bag.
   4. Sheet materials: 6” x 6” samples of each type.

D. Shop Drawings: Shop drawings shall include typical and special details of all sheet metal work and flashing details as requested by DCAS.

E. Qualification Data: For Installer.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm demonstrating a minimum of five years of successful work on projects of similar roofing type and work complexity.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials in manufacturer's original unopened containers and rolls with manufacturer's labels intact and legible. Where materials are covered by a referenced specification, the container shall bear the specification number, type and class, as applicable. Labels or bill of lading for roofing materials shall completely describe said materials. Deliver materials in sufficient quantity to allow continuity of work.

B. Storage: Protect roll materials against moisture absorption. Store roll materials on end on clean raised platforms in dry locations with adequate ventilation. Tie covering securely to the pallets in such a way as to be completely weather-tight and yet provide sufficient ventilation to prevent condensation. Polyethylene coverings are not permitted. Do not store more materials on the roof than can be installed the same day. Locate materials temporarily stored on the roof in approved areas and distribute the load to stay within the live load limits of the roof construction.

C. Handling: Select and operate material handling equipment so as not to damage existing construction and applied roofing. Handle roll materials in a manner to prevent damage to edges and ends.

D. Replace lids on cans of material stored on the job site.

E. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing manufacturer. Protect stored liquid material from direct sunlight. Protect water based materials from freezing.

1.9 ENVIRONMENTAL CONDITIONS

A. Application will not be permitted during inclement weather or when air temperature is below 40° F or is expected to go below 40° F within twenty-four (24) hours or when there is ice, frost, surface moisture, or visible dampness on the roof deck. (The restriction on the application of roofing materials below 40° F will be waived if the Contractor devises some artificial means, satisfactory to DCAS. of (I) maintaining the surrounding temperature above 40° F; and (2) maintaining the application temperature of heated materials without exceeding the "maximum specified kettle temperature. Maximum kettle temperature shall not be exceeded under any conditions.)

1. At such times when snow or rain is imminent, work must be discontinued and work areas and materials must be properly covered and protected against the elements.
2. The Contractor shall submit, for DCAS's action, a statement denoting the kind and type of

protection he proposes to use in the event of adverse weather conditions.

3. Failure to comply with the above requirements will be the Contractor's responsibility to replace the roofing and pay for any damages resulting therefrom, over and above the provisions of the Guarantee.

B. The roof deck must be dry at the time roofing operations commence, to avoid later problems with water vapor trapped under the membrane. A deck should not be roofed when rain, snow, or frost is present in or on the deck material.

C. Cold temperatures: Apply roofing materials only when correct bitumen temperatures can be maintained. "Wind chill" and surface temperature affects application temperatures. Keep surface temperature and asphalt thermometers at the work site.

D. Hot temperatures: In hot weather the bitumen will cool slowly, which can lead to sticking, making the membrane susceptible to physical damage from mechanical equipment and foot traffic.

E. Wind: Wind can blow hot materials, mastics and coatings causing damage to surrounding property and making the handling of roll materials difficult.

1.10 REINSTALLATION ROOFING CONFERENCE

A. Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, roofing Installer, roofing manufacturer's representative, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing repair work, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review structural loading limitations of roof deck during and after roofing.
5. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing.
6. Review governing regulations and requirements for insurance and certificates if applicable.
7. Review temporary protection requirements for roofing during and after installation.

1.11 PROTECTION OF PROPERTY

A. Protective Coverings: Lap protective coverings not less than 6 inches, secure against wind, and vent to prevent collection of moisture on covered surfaces. Protective coverings shall remain in place for the duration of the roofing work.

B. Flame-Heated Equipment: Locate and use flame-heated equipment at locations that will not endanger the structure or other materials on the site or adjacent property. Do not place flame-heated equipment on the roof. Provide and maintain one (1) fire extinguisher of appropriate type and size adjacent to flame-heated equipment.

1.12 GUARANTEE

A. In accordance with the Article on Guarantees in the General Conditions governing all contracts, the Contractor hereby guarantees all workmanship described in this Section for a period of 5 years and materials described in this Section for a period of 10 years.

B. The Contractor shall furnish security for the faithful performance of the above guarantee in the form of a surety bond executed by a duly authorized surety company in the penal sum of 25% of the cost of the work of the Section. The bond shall be in a form satisfactory to the Commissioner and the Comptroller of the City of New York. The required surety bond shall be effective for a two-year period. The Contractor performing the work of this Section shall furnish proof of its ability to obtain the type of bond described above, before the work is started.

C. The following types of failure will be adjudged as defective work:
1. All Work – Leaking, failure to stay in place.
2. Sheet Metal Work- Undue expansion, lifting, deformation, loosening, spitting up of seams.
3. Built-Up Roofs- Splitting, pulling loose from substrate, alligatoring, buckling, tearing.
4. Wearing Surfaces- Splitting, pulling loose tram substrate, buckling, opening up of joints, undue expansion and contraction.

PART 2- PRODUCTS

2.1 MATERIALS

A. Use similar or materials thus restoring the existing roof to a fully watertight condition.

B. New replacement materials shall be compatible with the existing material and of equal quality.
1. Replacement roof assembly shall consist of materials that have been tested and listed by UL for application indicated with UL “Class A” rating and Factory Mutual “Class I”.
2. Replacement insulation shall be of same type and thickness as existing material that has been removed. New insulation shall have an “R” factor equal to or greater than the existing insulation which is to remain.
    a. If existing insulation has a vapor barrier, then new insulation shall have matching vapor barrier.
3. Bitumen shall be the same material as existing and shall be certified compatible by the bitumen manufacturer.

C. Provide additional layers or strip membrane materials at joint between new and old roof, metal flashings, metal flanges, roof drains, vent pipe cracks, and at any other penetrations through the substrate construction as specified by roofing manufacturer.

D. Aggregate: Material, color and size matching existing and approved by DCAS.

E. Materials for Sheet Metal Work:
1. Materials for metal flash and related sheet metal work shall match existing conforming to ASTM Specifications of the following types and finishes. All material to match existing.
2. Unless otherwise hereinafter specified, stainless steel sheet shall be of the following U.S. Standard gauge numbers.
3. Solder genera1ly shall be 50-50 pure block tin and pig lead.
4. Solder for jointing on surfaces which are exposed to view shall be 60-40 pure block tin and

pig lead.

5. Flux for use in connection with soldering shall be recommended by the manufacturer on the stainless steel.
6. Paint for concealed coating of dissimilar metals shall be an approved brand of black asphaltum and/ or zinc chromate paint.
7. Nails for metal work shall be 3/8" diameter head, stainless steel.
8. Expansion shields shall be lead or galvanized steel. Screws, bolts, and other miscellaneous fastenings shall be galvanized steel or stainless steel.

F. Form watertight umbrella and roof jacks in accordance with NRCA standards. Flash into existing roofing. Extend all flashings as required tie new work into existing work. Make all connections watertight.

PART 3- EXECUTION

3.1 EXAMINATION

A. The Contractor shall perform the following:
1. Examine areas to be patched and repaired. Inspect existing conditions.
2. Review roofing requirements.
3. Review materials and methods.
4. Review installers personnel, equipment and facilities required.
5. Review inspection, testing and certifying procedures.

B. Inspection of existing conditions shall include:
1. Examination of the surface for obvious cracks, blisters, or ridges in the membrane.
2. Examination of the surface for bald spots, areas where the gravel (built-up roof) or mineral granules (roll roofing) are missing.
3. Especially diligent examination where the roof meets parapets, chimneys, vents, and other vertical surfaces.

C. If possible, check the underside of the rafters and decking for water stains or rot which would indicate water infiltration, realizing that water can migrate through layers of roof plies from distant points.

D. Check the interior, especially ceilings and around fireplaces and vent pipe locations, for clues as to the location of any leaks.

3.2 COORDINATION

A. Coordinate work covered under this Section with contiguous work of other trades or contracts. Carry out the work in accordance with a schedule of operation jointly prepared and accepted by all other trades or contracts involved.

3.3 REMOVAL OF EXISTING MATERIALS

A. Contractor shall scour, remove, and stockpile existing gravel for reuse whenever practical. Remove insulation to the extent required to do the work. Boards that are wet, have punctured

vapor barrier, have broken edges or corners, or are damaged in any manner shall be discarded and removed.

B. Contractor shall provide a temporary waterproof covering for areas that are exposed to the elements until such time as the new roofing can be installed. Protect furniture, equipment, etc. from water damage.

C. Removal and relocation operations shall take place according to a prior approved schedule and place of operations.

D. Do not overload roof slab and other structural members when stockpiling materials.

3.4 PROTECTION OF WORK

A. When transporting liquid bitumen to the roof, protect adjacent surfaces and permanent equipment by providing masking or covering. Secure covering without the use of adhesive backed tape or nails. Impervious sheeting which produces condensation should not be used.

B. Keep a portable fire extinguisher on hand where work is being done.

C. At the end of each workday provide temporary roofing when existing roof is being opened for repair or replacement. Provide an effective way to divert water runoff away from open roof.

D. Protection of Work: Protect roofing work during construction operations and installations by other trades involved. Provide pathways of wood planks or plywood panels designed to protect completed roofing work against damages of any kind during installations by other trades and contracts within the roof deck areas.

3.5 PREPARATORY WORK

A. Surfaces to receive roofing and insulation must be free of defects, broom clean, dry, free from any substances which may affect the adherence qualities of the bonding materials used in connection therewith. Sweep exposed felts clean of loose aggregate, dirt and silt with stiff bristled brush or broom. Sweep at least six inches into embedded aggregate in all directions. Clean all roof surfaces, including parapets, copings, and flashings.
   1. Use a long-handled push broom.
   2. In the case of a tar and gravel roof, cut the gravel off by hand or use a gravel removing machine as required.
   3. Masonry cleaning should include brushing of any efflorescence from the brickwork using stiff, non-metallic bristle brushes.

B. Do not begin repair of flashings until completion of all pointing or resetting of parapet units and repair of coping joints.

C. Go over the entire roof area with roofer's chalk, marking areas where repair work is to be done.

3.6 WORKMANSHIP, GENERAL

A. Work shall be completed by an approved applicator in a manner conducive to good workmanship and overall compliance with the specification.

B. Materials shall be mixed, thinned, modified and applied as directed by the manufacturer's instructions.

3.7 APPLICATION OF INSULATION

A. Secure insulation to deck in same manner as existing insulation. Bun insulation boards hand-tight, to each other. At junction of new and existing insulation, hand cut new boards for a tight fit. Tape joint using manufacturer-recommended tape.

3.8 INSTALLATION OF BUILT-UP ROOF MEMBRANE

A. Repairing open lap joints on roll roofing:
   1. Force lap cement or asphalt cement under open seam. Weight it down with heavy weight until it is dry.
   2. If it pops again, slit wrinkle being careful not to cut sound layers of roofing below.
   3. Using 1-1/2 inch galvanized roofing nails secure both sides of the slit.
   4. Using 90-lb. roofing felt, cut a patch large enough to cover the nail heads with a 2 inch overlap on all sides.
   5. Coat the back of the patch with asphalt cement and press it into place over the nails.
   6. Nail the edges of the patch with nails spaced about 1 inch apart and cover the nail heads with more asphalt cement.
   7. Finish the patch by sprinkling light colored fine gravel or sand over the wet cement. Do not eliminate this last step. The gravel or sand reflects sunlight thus slowing the drying out process.

B. Repairing Small Blisters:
   1. If no leaks are evident, apply a solar reflective treatment (see Section 3.03 B.3. below).
      -OR-
   2. Starcut the blister with a hook-nosed linoleum knife or a utility knife to release trapped air;
   3. If the felt layers beneath the surface are dry proceed with the repair.
   4. If they are damp, deepen the cut down to the wood sheathing and let the roofing dry out before proceeding. A portable electric heater-fan or hair dryer can be used to speed up the process.
   5. Patch the area and apply a solar reflective treatment (see Section 3.03 B.3. below).
      -OR-
   6. Release entrapped moisture by installing drying units with evaporation tubes (see manufacturer's instructions for installation procedures).
   7. If leaks are present, allow entrapped moisture to dry and then remove the felts and replace with new.

C. To Prevent Blistering:
   1. Apply chippings over the surface (a form a solar reflective treatment): Chippings are usually light colored, of limestone, granite, gravel, calcite or feldspar, 6-10 mm in size set in bitumen compound after the asphalt is laid.

2. Advantages of chippings:
3. Helps cool the membrane.
4. Helps hold down the membrane.
5. Disadvantages of chippings:
6. Outlets may become blocked.
7. Leaks in roof are difficult to locate and bonded chippings are difficult to remove.
8. Alternatives of chippings include mineral-surfaced roofing and liquid-applied surface coatings (very effective on top of glass-base felts, but not so effective with others).

D. Repairing Undulations:
1. One alternative is to remove and relay the roof with new felts.
2. If not a serious problem, that is the problem will not be exacerbated by foot traffic on the roof, then an application of solar reflective treatment should aid in reducing the spread of undulations.

E. Repairing larger damaged areas on either built-up or roll roofing:
1. Cut out damaged plies leaving sound layers intact.
2. Dip knife in turpentine periodically while cutting to keep the blade free of tar and felt fibers, and pull out the layers of felt individually.
3. If water has soaked the felt, remove all the roofing within the rectangle, down to the sheathing and dry the area thoroughly.
4. With the damaged area removed, apply asphalt cement under loose edges of cuts and over the entire cut out area.
5. Using 90-lb. roofing felt, cut out patches the same size as the cut-out. Press first patch into asphalt cement. Apply another coating of asphalt cement to cut-out and press another patch into place. Repeat process until the patch is even with the surrounding roof. The number of layers will depend on the depth of the cut-out.
6. Cut a final patch of either roofing felt or mineral roll roofing which will overlap the cut-out area by 2 inches on all sides. Cover the bottom of the final patch with asphalt cement, press in place, and nail edges with nails spaced about 3/4 to 1 inch apart. Cover nail heads with asphalt cement and sprinkle fine gravel or sand over, as in A.3. above.

F. Repairing cracks in Asphalt Flashing:
1. Clean the area of any gravel or other debris.
2. Coat area around crack with asphalt cement extending 6-inches beyond crack in all directions.
3. Lay a piece of 90-lb. roofing felt in the cement maintaining the 6-inch overlap.
4. Repeat steps (2) and (3).
5. Finish patch with a final coat of asphalt cement and lay sand or gravel on the horizontal surfaces.
6. If there are simply bald spots on the surface, sweep up any dirt and debris; paint area with roof coating and re- spread or add more gravel.
7. NOTE: DO NOT use reflective paints instead of sand or gravel, except on vertical portions of flashing. Though it is not fully understood why, reflective paints encourage wrinkling, a potentially serious form of deterioration.
8. Inspect patch at least twice a year to make sure it is still sound.

G. Patching:
1. Apply bed coat of bitumen and then the first ply of built-up roofing which shall extend not

less than 6 inches beyond the patched area. Each succeeding ply shall extend not less than 6 inches beyond the preceding ply. (Three or four plies to match original roof composition.) All plies laid shingle style. Apply flood coat onto top ply and then apply bridge ply 3 feet wide over center of original cut. Over this apply second and third bridge plies each extending 6 inches on either side of preceding ply. Cover bridge plies with new flood coat and reinstall gravel over entire patch area to match existing work.

3.9 SHEET METAL WORK

A. Preparation: Clean surfaces and areas designed to be covered with sheet metal, free from dirt, mortar dropping, loose particles or any foreign substances with may adversely affect the superimposed installation.

B. Fabrication: Form sheet metal to required shapes and sizes. Assemble in as long lengths as practicable and join by means of locked and soldered seams.
1. Prior to soldering, clean and roughen edges with a coarse emery cloth at least 2 inches on each side of joint to produce suitable surfaces for pre-tinning operation.
2. Method of soldering, welding and use of flux shall be carried out in strict accordance with stainless steel manufacturer's recommendations and printed specifications.
3. Use suitable type of solder and flux for joining sheet metal members which are exposed to view.
4. Immediately after soldering, remove all traces of acid and flux by swabbing with 5% to 10% solution of washing soda or other approved neutralizer, followed by a clear water rinse.
5. Seams other than expansion joints shall be soldered continuously showing one (1) full inch of evenly flowed solder. Wherever possible, solder joints in a flat position. Fabrication and installation shall provide watertight assemblies in the completed work.
6. Installed sheet metal work shall be clean, straight, true and performed to the satisfaction of DCAS.

3.10 CLEANING

A. Work under this Section shall be left in a clean and orderly condition, secure and true to the satisfaction of DCAS.

B. Sheet metal work, when finished, shall be thoroughly cleaned of all flux and, din. Excess flux which may cause acid stains must be neutralized by washing with a solution of five to ten percent (5%- 10%) washing soda. After cleaning, surfaces shall be washed with clear water.

C. Remove empty containers and debris, etc. from the roof surfaced about the premises resulting from the work and clean or otherwise restore surfaces damaged as a result of the work operations.

3.11 MEASUREMENT & PAYMENT

A. Unit Prices – SEE BID SHEET

B. Unit prices include surface preparation insulation, temporary covers and related materials.

C. The unit price for flashing at roof penetrations as pertains to the Work of this Section will not be applied to payment for other flashing work specified in other sections of work.

END OF SECTION 075100

SECTION 075113
BUILT-UP ASPHALT ROOFING

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Contract Documents apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Built-up asphalt roofing.
2. Vapor retarder.
3. Roof insulation.

B. Section includes the installation of insulation strips in ribs of acoustical roof deck. Insulation strips are furnished under Division 05 Section "Steel Decking."

C. Related Sections:
1. Division 07 Section "Thermal Insulation" for insulation beneath the roof deck.
2. Division 07 Section "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.3 DEFINITIONS

A. Roofing Terminology: Roofing terminology and other terms related to built-up roofing and waterproofing used in this Section shall be as defined in ASTM D 1079-18 (https://www.astm.org/Standards/D1079.htm), “Standard Terminology Related to Roofing and Waterproofing;” and glossary of NRCA's "The NRCA Roofing Manual 2019” and “The NRCA Waterproofing Manual" (http://www.nrca.net). .

B. Hot Roofing Asphalt: Roofing asphalt heated to its equiviscous temperature, the temperature at which its viscosity is 125 centipoises for mop-applied roofing asphalt and 75 centipoise for mechanical spreader-applied roofing asphalt, within a range of plus or minus 25 deg F, measured at the mop cart or mechanical spreader immediately before application.

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Installed built-up roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Built-up roofing and base flashings shall remain watertight. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by built-up roofing manufacturer based on testing and field experience.

B. Roofing System Design: Provide built-up roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.
1. Corner Uplift Pressure: 42 lbf/sq. ft.
2. Perimeter Uplift Pressure: 28 lbf/sq. ft.

3. Field-of-Roof Uplift Pressure: 16.8 lbf/sq. ft.

C. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.

D. Energy Performance: Provide roofing system that is listed on the Department of Energy's ENERGY STAR "Roof Products Qualified Product List" (https://www.energystar.gov/products/building_products/roof_products) for low-slope roof products.

E. Energy Performance: Provide roofing system with initial solar reflectance not less than 0.70 and emissivity not less than 0.75 when tested according to CRRC-1.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:
1. Product Test Reports for Credit SS 7.2: For roof materials, indicating that roof materials comply with Solar Reflectance Index requirement.
2. Product Data for Credit IEQ 4.1: For adhesives and sealants used inside the weatherproofing system, documentation including printed statement of VOC content.
3. Laboratory Test Reports for Credit IEQ 4: For adhesives and sealants used inside the weatherproofing system, documentation indicating that they comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: For built-up roofing. Include plans, elevations, sections, details, and attachments to other work.
1. Base flashings and built-up terminations.
2. Tapered insulation, including slopes.
3. Crickets, saddles, and tapered edge strips, including slopes.
4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

D. Samples for Verification: For the following products:
1. Built-up roofing materials, including base sheet, ply sheet, cap sheet, and flashing sheet, of color specified.
2. Roof insulation.
3. Three (3) lb of aggregate surfacing material in gradation and color indicated.
4. Roof paver, full sized, in each color and texture required.
5. Walkway pads.
6. Six (6) insulation fasteners of each type, length, and finish.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: Submit reports that demonstrates capabilities and experience of the Installer and the manufacturer.

B. Manufacturer Certificates: Signed by roofing manufacturer certifying that built-up roofing

complies with requirements specified in "Performance Requirements" Article.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of built-up roofing.

D. Research/Evaluation Reports: For components of built-up roofing, from the ICC-ES, applicable New York State Building Codes and applicable New York City Building Codes.

E. Warranties: Sample of special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For built-up roofing to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer that is certified for built-up roofing identical to that used for this Project.

B. Installer Qualifications: A firm that is approved, authorized, or licensed by built-up roofing manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

C. Source Limitations: Obtain components including but not limited to roof insulation and fasteners for built-up roofing from same manufacturer as built-up roofing or as approved by built-up roofing manufacturer.

D. Exterior Fire-Test Exposure: ASTM E 108, Class A, Class B, and/ or Class C (building construction class to be verified in field); for application and roof slopes indicated, as determined by testing identical built-up roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

E. Fire-Resistance Ratings: Where indicated, provide fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

F. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.
   1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
   2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
   3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
   5. Review structural loading limitations of roof deck during and after roofing.

6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing during and after installation.
9. Review roof observation and repair procedures after roofing installation.

G. Preinstallation Roofing Conference: Conduct conference at Project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing manufacturer. Protect stored liquid material from direct sunlight.
1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.10 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing to be installed according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of built-up roofing that fail in materials or workmanship within specified warranty period.
   1. Warranty includes but is not limited to built-up roofing membrane, base flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories, roof pavers, and other components of built-up roofing.
   2. Warranty Period: Fifteen (15) years from date of Substantial Completion.

B. Special Installer's Warranty: Submit roofing Installer's warranty, without monetary limitation, signed by Installer, covering the Work of this Section, including all components of built-up roofing such as built-up roofing membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:
   1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2- PRODUCTS

2.1 BUILT-UP ROOFING MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work:

   1. Barrett Company.
   2. CertainTeed Corp.
   3. Ecology Commercial and Industrial Roofing Systems.
   4. Fields Company, LLC.
   5. Firestone Building Products.
   6. GAF Materials Corporation.
   7. Hickman, W. P. Systems, Inc.
   8. Johns Manville.
   9. Malarkey Roofing Company.
   10. TAMKO Building Products, Inc.
   11. Tremco, Incorporated.
   12. U.S. Intec, Inc.; Division of BMCA.
   13. Or an Approved Equal.

2.2 BASE-SHEET MATERIALS

A. Sheathing Paper: Red-rosin type, minimum 3 lb/100 sq. ft.

B. Base Sheet: ASTM D 4601, Type II, SBS or SEBS-modified, asphalt-impregnated and -coated sheet, with glass-fiber-reinforcing mat, dusted with fine mineral surfacing on both sides.
   1. Weight as recommended by built-up roofing manufacturer for application.

C. Base Sheet: ASTM D 4601, Type I or II as recommended by built-up roofing manufacturer for application, nonperforated, asphalt-impregnated and -coated, glass-fiber sheet, dusted with fine mineral surfacing on both sides.

D. Base Sheet: ASTM D 4897, Type II, venting, nonperforated, heavyweight, asphalt-impregnated

and -coated, glass-fiber base sheet with coarse granular surfacing or embossed venting channels on bottom surface.

E. Base Sheet: ASTM D 2626, asphalt-saturated and -coated organic felt, dusted with fine mineral surfacing on both sides.

2.3 ROOFING MEMBRANE PLIES

A. Ply Sheet: ASTM D 2178, Type IV or VI as recommended by built-up roofing manufacturer for application, asphalt-impregnated, glass-fiber felt.

B. Cap Sheet: ASTM D 3909, asphalt-impregnated and -coated, glass-fiber cap sheet, with white coarse mineral-granule top surfacing and fine mineral surfacing on bottom surface.

2.4 BASE FLASHING SHEET MATERIALS

A. Backer Sheet: ASTM D 2178, Type IV or VI as recommended by built-up roofing manufacturer for application, asphalt-impregnated, glass-fiber felt.

B. Backer Sheet: ASTM D 4601, Type I or II as recommended by built-up roofing manufacturer for application, asphalt-impregnated and -coated, glass-fiber sheet, dusted with fine mineral surfacing on both sides.

C. Backer Sheet: ASTM D 2626, asphalt-saturated and -coated organic felt, dusted with fine mineral surfacing on both sides.

D. Granule-Surfaced Flashing Sheet as recommended by built-up roofing manufacturer for application: ASTM D 6164, Grade G, Type I or II, polyester-reinforced; ASTM D 6163, Grade G, Type I or II, glass-fiber-reinforced; ASTM D 6162; Grade G, Type I or II, composite polyester-reinforced and glass-fiber-reinforced, SBS or SEBS-modified asphalt sheet; granular surfaced; suitable for application method specified, and as follows:
1. Granule Color: White

E. Metal-Foil-Surfaced Flashing Sheet: ASTM D 6298, glass-fiber-reinforced, SBS or SEBS-modified asphalt sheet; metal-foil surfaced; suitable for application method specified, and as follows:
1. Foil Surfacing: Aluminum

F. Smooth-Surfaced Flashing Sheet as recommended by built-up roofing manufacturer for application: ASTM D 6222, Grade S, Type I or II, polyester-reinforced; ASTM D 6223, Grade S, Type I or II, composite polyester-reinforced and glass-fiber-reinforced, APP-modified asphalt sheet; smooth surfaced; suitable for application method specified.

G. Granule-Surfaced Flashing Sheet as recommended by built-up roofing manufacturer for application: ASTM D 6222, Grade G, Type I or II, polyester-reinforced; ASTM D 6223, Grade G, Type I or II, composite polyester-reinforced and glass-fiber-reinforced, APP-modified asphalt sheet; granular surfaced; suitable for application method specified, and as follows:
1. Granule Color: White

H. Glass-Fiber Fabric: Woven glass-fiber cloth, treated with asphalt, complying with ASTM

D 1668, Type I.

2.5 ASPHALT MATERIALS

A. Asphalt Primer: ASTM D 41.

B. Roofing Asphalt as recommended by built-up roofing manufacturer for application: ASTM D 312, Type III or IV.

C. Roofing Asphalt: ASTM D 6152, SBS or SEBS modified.

2.6 AUXILIARY BUILT-UP ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing manufacturer for intended use and compatible with built-up roofing.
   1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
   2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
      a. Plastic Foam Adhesives: 50 g/L.
      b. Gypsum Board and Panel Adhesives: 50 g/L.
      c. Multipurpose Construction Adhesives: 70 g/L.
      d. Fiberglass Adhesives: 80 g/L.
      e. Contact Adhesives: 80 g/L.
      f. Other Adhesives: 250 g/L.
      g. Nonmembrane Roof Sealants: 300 g/L.
      h. Sealant Primers for Nonporous Substrates: 250 g/L.
      i. Sealant Primers for Porous Substrates: 775 g/L.
   3. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Cold-Applied Adhesive: Roofing manufacturer's standard asphalt-based, one- or two-part, asbestos-free, cold-applied adhesive specially formulated for compatibility and use with built-up base flashings.

C. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required by roofing manufacturer for application.

D. Mastic Sealant: Polyisobutylene, plain or modified bitumen, nonhardening, nonmigrating, nonskinning, and nondrying.

E. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions, designed for fastening built-up roofing components to substrate, tested by manufacturer for required pullout strength, acceptable to roofing manufacturer and Underwriters Laboratories® (“UL”) listed, as required.

F. Metal Flashing Sheet: Metal flashing sheet is specified in Division 07 Section "Sheet Metal

Flashing and Trim."

G. Aggregate Surfacing as recommended by built-up roofing manufacturer for application: ASTM D 1863, No. 6 or No. 67, clean, dry, opaque, water-worn gravel or crushed stone, free of sharp edges; or crushed slag, free of sharp edges.

H. Miscellaneous Accessories: Provide miscellaneous accessories recommended by built-up roofing manufacturer.

2.7 SUBSTRATE BOARDS

A. Substrate Board: ASTM C 1396/C 1396M, Type X gypsum board, 5/8 inch thick.

B. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, thickness as recommended by built-up roofing manufacturer for application, factory primed.
   1. Products: Subject to compliance with requirements, provide available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Georgia-Pacific Corporation: Dens Deck, Dens Deck Prime, Dens Deck DuraGuard;
      b. Or an Approved Equal.

C. Substrate Board: ASTM C 1278/C 1278M, cellulosic-fiber-reinforced, water-resistant gypsum substrate, thickness as recommended by built-up roofing manufacturer for application.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. USG Corporation; Securock or approved equal.

D. Substrate Board: ASTM C 728, perlite board, thickness as recommended by built-up roofing manufacturer for application, seal coated.

E. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions, designed for fastening substrate board to roof deck and UL listed if applicable.

2.8 VAPOR RETARDER

A. Polyethylene Film: ASTM D 4397, 6 mils thick, minimum, with maximum permeance rating of 0.13 perm.
   1. Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
   2. Adhesive: Manufacturer's standard lap adhesive, FM Approvals approved for vapor-retarder application.

B. Laminated Sheet: Kraft paper/polyethylene laminate, two layers, reinforced with woven fiberglass yarn, laminated and edge reinforced, with maximum permeance rating of 0.50 perm and with manufacturer's standard adhesive.

C. Self-Adhering Sheet Vapor Retarder: ASTM D 1970, minimum of 40-mil-thick, polyethylene film laminated to layer of rubberized asphalt adhesive; maximum permeance rating of 0.1 perm; cold-applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor-retarder manufacturer.

D. Self-Adhering Sheet Vapor Retarder: 30- to 40-mil- thick, polyethylene film laminated to layer of butyl rubber adhesive; maximum permeance rating of 0.1 perm; cold-applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor-retarder manufacturer.

E. Glass-Fiber Felts: ASTM D 2178, Type IV, asphalt impregnated.

2.9 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.

B. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, 1.6-lb/cu. ft. or X, 1.3-lb/cu. ft. (21-kg/cu. m) minimum density, as recommended by built-up roofing manufacturer for application, square edged.

C. Molded-Polystyrene Board Insulation as recommended by built-up roofing manufacturer for application: ASTM C 578 Type II, 1.35-lb/cu. ft. or VIII, 1.15-lb/cu. ft., or IX, 1.8-lb/cu. ft. minimum density.

D. Composite Molded-Polystyrene Board Insulation as recommended by built-up roofing manufacturer for application: ASTM C 578, Type II, 1.35-lb/cu. ft., or Type VIII, 1.15-lb/cu. ft., or Type IX, 1.8-lb/cu. ft. (29-kg/cu. m) minimum density, with factory-applied facings, as follows:
1. Facer: ASTM C 208, Type II, Grade 2, cellulosic-fiber insulation board, asphalt coated, 1/2 inch thick.
2. Facer: DOC PS 2, Exposure 1, OSB, 7/16 inch thick.

E. Polyisocyanurate Board Insulation as recommended by built-up roofing manufacturer for application: ASTM C 1289, Type II, Class 1, Grade 2 or Type II, Class I, Grade 3, felt or glass-fiber mat facer on both major surfaces.

F. Composite Polyisocyanurate Board Insulation: ASTM C 1289, with factory-applied facing board on one major surface as indicated below by type, and felt or glass-fiber mat facer on the other surface.
1. Type IV, cellulosic-fiber-insulating-board facer, Grade 2, 1/2 inch thick.
2. Type V, OSB facer, 7/16 inch thick.
3. Type VII, glass mat faced gypsum board facer, 1/4 inch thick.

G. Perlite Board Insulation: ASTM C 728, rigid, mineral-aggregate thermal insulation board composed of expanded perlite, cellulosic fibers, binders, and waterproofing agents with top surface seal coated.

H. Cellulosic-Fiber Board Insulation: ASTM C 208, Type II, Grade 2, fibrous-felted, rigid insulation boards of wood fiber or other cellulosic-fiber and water-resistant binders, asphalt impregnated, chemically treated for deterioration.

I. Cellular-Glass Board Insulation: ASTM C 552, Type IV, rigid, cellular-glass thermal board insulation faced with manufacturer's standard kraft-paper sheets.

J. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48) unless otherwise indicated.

K. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.10 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with built-up roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate and acceptable to roofing manufacturer.

C. Modified Asphaltic Insulation Adhesive: Insulation manufacturer's recommended modified asphaltic, asbestos-free, cold-applied adhesive formulated to attach roof insulation to substrate or to another insulation layer.

D. Bead-Applied Insulation Adhesive: Insulation manufacturer's recommended bead-applied, low-rise, one- or multicomponent urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.

E. Full-Spread Applied Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.

F. Insulation Cant Strips: ASTM C 728, perlite insulation board.

G. Insulation Cant Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.

H. Wood Nailer Strips: Comply with requirements in Division 06 Section “Rough Carpentry and Miscellaneous Rough Carpentry."

I. Tapered Edge Strips: ASTM C 728, perlite insulation board.

J. Tapered Edge Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.

K. Cover Board: ASTM C 208, Type II, Grade 2, cellulosic-fiber insulation board, 1/2 inch thick.

L. Cover Board: DOC PS 2, Exposure 1, OSB, 7/16 inch thick.

M. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/4 inch, 1/2 inch, or 5/8 inch thick as recommended by built-up roofing manufacturer for application, factory primed.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Georgia-Pacific Corporation; Dens Deck, Dens Deck Prime, or Dens Deck DuraGuard,
      b. Or an Approved Equal.

N. Cover Board: ASTM C 1278/C 1278M, cellulosic-fiber-reinforced, water-resistant gypsum

substrate, 1/4-inch, 3/8-inch, 1/2 inch, or 5/8 inch thick as recommended by manufacturer for application.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. USG Corporation; Securock;
   b. Or an Approved Equal.

O. Substrate Joint Tape: 6- or 8-inch- wide as recommended by manufacturer for application, coated, glass fiber.

2.11 COATING MATERIALS

A. Roof Coating: ASTM D 1227, Type II Class 1, mineral-colloid-emulsified, fibered or Class 2, chemically emulsified, filled or fibered, asphalt emulsion as recommended by manufacturer for application, asbestos free.

B. Roof Coating: ASTM D 1227, Type III, Class 1, mineral-colloid-emulsified or Class 2, chemically emulsified] asphalt emulsion, as recommended by manufacturer for application, nonfibered.

C. Roof Coating: ASTM D 2824, Type I, nonfibered or Class III, fibered, asbestos-free aluminum-pigmented asphaltic coating as recommended by manufacturer for application.

D. Roof Coating: Acrylic elastomer emulsion coating, formulated for use on bituminous roof surfaces and complying with ASTM D 6083. the following:
   1. Initial Percent Elongation (Break): Not less than 60 percent at 0 deg F and 200 percent at 73 deg F when tested according to ASTM D 2370.
   2. Initial Tensile Strength (Maximum Stress): Not less than 100 psi at 73 deg F and 200 psi at 0 deg F when tested according to ASTM D 2370.
   3. Final Percent Elongation (Break) after Accelerated Weathering 1000 hrs.: Not less than 40 percent at 0 deg F and 100 percent at 73 deg F when tested according to ASTM D 2370.
   4. Permeance: Not more than 50 perms when measured according to ASTM D 1653.
   5. Accelerated Weathering 1000 hrs.: No cracking or checking when tested according to ASTM D 4798.
   6. Color: White

2.12 WALKWAYS

A. Walkway Pads: Mineral-granule-surfaced, reinforced asphaltic composition or Polymer-modified, reconstituted solid-rubber, surface-textured as recommended by built-up roofing manufacturer for application. Walkway pad to be slip-resisting pads, manufactured as a traffic pad for foot traffic and acceptable to roofing manufacturer, 3/8-inch, 1/2 inch, 3/4 inch thick, minimum, as recommended by manufacturer for application.
   1. Pad Size: Full size.

B. Walkway Cap Sheet Strips: ASTM D 6164, Grade G, Type I or II, polyester-reinforced, or ASTM D 6163, Grade G, Type I or II, glass-fiber-reinforced, or ASTM D 6162, Grade G, Type I or II, composite polyester-reinforced and glass-fiber-reinforced as recommended by built-up roofing manufacturer for application. SBS or SEBS-modified asphalt sheet; granular surfaced; suitable for application method specified, and as follows:

1. Granule Color: White

C. Roof Pavers: Heavyweight, hydraulically pressed, concrete units, square edged 3/16-inch, factory cast for use as roof pavers; absorption not greater than 5 percent, ASTM C 140; no breakage and maximum 1 percent mass loss when tested for freeze-thaw resistance, ASTM C 67; and as follows:
   1. Size: 24 by 24 inches. Manufacture pavers to dimensional tolerances of plus or minus 1/16 inch in length, height, and thickness.
   2. Weight: 25 lb/sq.
   3. Compressive Strength: 7500 psi, or 6500 psi, minimum; ASTM C 140.
   4. Colors and Textures: As selected by Architect from manufacturer's full range.

PART 3- EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
   1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
   2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
   3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 05 Section "Steel Decking."
   4. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch out of plane relative to adjoining deck.
   5. Verify that minimum concrete drying period recommended by roofing manufacturer has passed.
   6. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
      a. Test for moisture by pouring 1 pint of hot roofing asphalt on deck at start of each day's work and at start of each roof area or plane. Do not proceed with roofing work if test sample foams or can be easily and cleanly stripped after cooling.
   7. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.

B. Proceed with installation only after the above-mentioned requirements and conditions have been verified.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Prime surface of concrete deck with asphalt primer at a rate of 3/4 gal./100 sq. ft. and allow primer to dry.

D. Install insulation strips in ribs of acoustical roof decks according to acoustical roof deck manufacturer's written instructions.

3.3 SUBSTRATE BOARD INSTALLATION

A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
   1. Fasten substrate board to top flanges of steel deck according to recommendations in UL Approvals' and for specified Windstorm Resistance Classification.
   2. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to built-up roofing manufacturer's written instructions.

3.4 VAPOR-RETARDER INSTALLATION

A. Polyethylene Film: Loosely lay polyethylene-film vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of two (2) inches and six (6) inches, respectively.
   1. Continuously seal side and end laps with tape or adhesive as recommended by manufacturer for application.

B. Laminate Sheet: Install laminate-sheet vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of two (2) inches and six (6) inches, respectively. Bond vapor retarder to substrate as follows:
   1. Apply adhesive at rate recommended by vapor-retarder manufacturer. Seal laps with adhesive.
   2. Apply ribbons of hot roofing asphalt at spacing, temperature, and rate recommended by vapor-retarder manufacturer. Seal laps with hot roofing asphalt.

C. Self-Adhering Sheet Vapor Retarder: Prime substrate if required by manufacturer. Install self-adhering sheet vapor retarder over area to receive vapor retarder, side and end lapping each sheet a minimum of three and a half (3-1/2) inches and six (6) inches, respectively. Seal laps by rolling. Built-up Vapor Retarder: Install two glass-fiber felt plies lapping each felt 19 inches over preceding felt. Embed each felt in a solid mopping of hot roofing asphalt. Glaze-coat completed surface with hot roofing asphalt. Apply hot roofing asphalt within plus or minus 25 deg F of equiviscous temperature.

D. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into built-up roofing.

3.5 INSULATION INSTALLATION

A. Comply with built-up roofing manufacturer's written instructions for installing roof insulation.

B. Install one lapped base sheet course and mechanically fasten to substrate according to built-up roofing manufacturer's written instructions.

C. Nailer Strips: Mechanically fasten 4-inch nominal-width wood nailer strips of same thickness as insulation perpendicular to sloped roof deck at the following spacing:
   1. 16 feet apart for roof slopes greater than 1 inch per 12 inches (1:12) but less than 3 inches

per 12 inches (3:12).
2. 48 inches apart for roof slopes greater 3 inches per 12 inches (3:12).

D. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of built-up roofing with vertical surfaces or angle changes greater than 45 degrees.

E. Install tapered insulation under area of roofing to conform to slopes indicated.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

G. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
1. Where installing composite and noncomposite board insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.

H. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

I. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

J. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:
1. Prime surface of concrete deck with asphalt primer at rate of 3/4 gal./100 sq. ft. and allow primer to dry.
2. Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.
3. Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
4. Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

K. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
1. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

L. Mechanically Fastened and Adhered Insulation: Install first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
1. Fasten first layer of insulation according to requirements for specified Windstorm Resistance Classification.
2. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
3. Set each subsequent layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 degrees Farenheit of equiviscous temperature.
4. Set each subsequent layer of insulation in ribbons of bead-applied insulation adhesive,

firmly pressing and maintaining insulation in place.

5. Set each subsequent layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

M. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of six (6) inches in each direction. Loosely butt cover boards together and fasten to roof deck. Tape joints if required by roofing manufacturer.

1. Fasten cover boards according to requirements in UL Approvals and Windstorm Resistance Classification.
2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.
3. Apply hot roofing asphalt to underside and immediately bond cover board to substrate.

3.6 BUILT-UP ROOFING INSTALLATION, GENERAL

A. Install roofing membrane according to roofing manufacturer's written instructions and applicable recommendations of ARMA/NRCA's " Quality Control Guidelines for the Application of Built-up Roofing."

1. Install roofing system BU-3, 4, 5-N, I, C-A-A, S, M, according to roof assembly identification matrix and roof assembly layout illustrations in NRCA's "The NRCA Roofing and Waterproofing Manual" and requirements in this Section.

B. Install roofing membrane according to roofing manufacturer's written instructions and applicable recommendations of ARMA/NRCA's "Quality Control Guidelines for the Application of Built-up Roofing" and as follows:

1. Deck Type: N (nailable), I (insulated), or C (concrete or nonnailable) as applicable.
2. Base Sheet: installed over sheathing paper.
3. Number of Ply Sheets: as recommended by manufacturer for application.
4. Surfacing Type: A (aggregate), S (asphalt surfacing or coating), orM (mineral-granule-surfaced cap sheet) as recommended by manufacturer for application.
5. Mineral-granule-surfaced cap sheet is in addition to number of ply sheets specified.

C. Start installation of built-up roofing in presence of manufacturer's technical personnel.

D. Where roof slope exceeds 1/2 inch per 12 inches (1:24) install built-up roofing sheets parallel with slope.

1. Backnail built-up roofing sheets to nailer strips or substrate, as verified in field, according to roofing manufacturer's written instructions.

E. Cooperate with testing agencies engaged or required to perform services for installing roofing.

F. Coordinate installation of roofing so insulation and other components of built-up roofing not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

1. Provide tie-offs at end of each day's work to cover exposed built-up roofing sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt with joints and edges sealed.
2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.
3. Remove and discard temporary seals before beginning work on adjoining roofing.

G. Asphalt Heating: Do not raise roofing asphalt temperature above equiviscous temperature range more than one hour before time of application. Do not exceed roofing asphalt manufacturer's recommended temperature limits during roofing asphalt heating. Do not heat roofing asphalt within 25 deg F of flash point. Discard roofing asphalt maintained at a temperature exceeding finished blowing temperature for more than four (4) hours.

H. Asphalt Heating: Heat and apply SBS or SEBS-modified roofing asphalt according to roofing manufacturer's written instructions.

I. Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging built-up roofing components or adjacent building construction.

3.7 ROOFING MEMBRANE INSTALLATION

A. Loosely lay one course of sheathing paper, lapping edges and ends a minimum of two (2) inches and six (6) inches, respectively.

B. Install lapped base sheet course, extending sheet over and terminating beyond cants. Attach base sheet as follows:
   1. Mechanically fasten to substrate.
   2. Spot- or strip-mop to substrate with hot roofing asphalt.
   3. Adhere to substrate in a solid mopping of hot roofing asphalt.

C. Install two, three or four ply sheets as recommended by manufacturer for application, starting at low point of roofing. Align ply sheets without stretching. Shingle side laps of ply sheets uniformly to achieve required number of plies throughout thickness of roofing membrane. Shingle in direction to shed water. Extend ply sheets over and terminate beyond cants.
   1. Embed each ply sheet in a solid mopping of hot roofing asphalt applied at rate required by roofing manufacturer, to form a uniform membrane without ply sheets touching.

D. Cap Sheet: Install lapped granulated cap sheet starting at low point of roofing. Offset laps from laps of preceding ply sheets and align cap sheet without stretching. Lap in direction to shed water. Extend cap sheet over and terminate beyond cants.
   1. Embed cap sheet in a solid mopping of hot roofing asphalt applied at rate required by built-up roofing manufacturer.

E. Aggregate Surfacing: Promptly after installing and testing roofing membrane, base flashing, and stripping, flood-coat roof surface with 60 lb/100 sq. ft. of hot roofing asphalt. While flood coat is hot and fluid, cast the following average weight of aggregate in a uniform course:
   1. Aggregate Weight: 400 lb/100 sq. ft., or 300 lb/100 sq. ft. as recommended by manufacturer for application.
   2. If aggregate surfacing is delayed, promptly apply glaze coat of hot roofing asphalt at a rate of 10 lb/100 sq. ft..

F. Glaze-coat roofing membrane surface with hot roofing asphalt applied at a rate of 10 to 15 lb/100 sq. ft.

3.8 FLASHING AND STRIPPING INSTALLATION

A. Install base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to built-up roofing manufacturer's written instructions and as follows:
   1. Prime substrates with asphalt primer if required by built-up roofing manufacturer.
   2. Backer Sheet Application: Mechanically fasten backer sheet to walls or parapets. Adhere backer sheet over built-up roofing at cants in a solid mopping of hot roofing asphalt, or cold-applied adhesive, as recommended by built-up roofing manufacturer for application.
   3. Backer Sheet Application: Adhere backer sheet to substrate in a solid mopping of hot roofing asphalt, cold-applied adhesive, as recommended by built-up roofing manufacturer for application.
   4. Flashing Sheet Application: Adhere flashing sheet to substrate in a solid mopping of hot roofing asphalt applied at not less than 425 deg F. Apply hot roofing asphalt to back of flashing sheet if recommended by roofing manufacturer.
   5. Flashing Sheet Application: Adhere flashing sheet to substrate in cold-applied adhesive at rate required by roofing manufacturer.
   6. Flashing Sheet Application: Adhere flashing sheet to substrate in asphalt roofing cement at rate required by roofing manufacturer.
   7. Flashing Sheet Application: Torch apply flashing sheet to substrate.

B. Extend base flashing up walls or parapets a minimum of eight (8) inches above built-up roofing and four (4) inches onto field of built-up roofing.

C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
   1. Seal top termination of base flashing with a strip of glass-fiber fabric set in asphalt roofing cement.

D. Install stripping, according to roofing manufacturer's written instructions, where metal flanges and edgings are set on built-up roofing.
   1. Flashing-Sheet Stripping: Install flashing-sheet stripping in a continuous coating of asphalt roofing cement or in a solid mopping of hot roofing asphalt applied at not less than 425 deg F, and extend onto roofing membrane.
   2. Flashing-Sheet Stripping: Install flashing-sheet stripping by heat welding and extend onto roofing membrane.
   3. Built-up Stripping: Install stripping of not less than two roofing membrane ply sheets, setting each ply in a continuous coating of asphalt roofing cement or in a solid mopping of hot roofing asphalt, and extend onto roofing membrane 4 inches and 6 inches, respectively.

E. Roof Drains: Set 30-by-30-inch metal flashing in bed of asphalt roofing cement on completed built-up roofing. Cover metal flashing with built-up roofing cap-sheet stripping and extend a minimum of 4 inches or 6 inches, as recommended by built-up roofing manufacturer for application, beyond edge of metal flashing onto field of built-up roofing. Clamp built-up roofing, metal flashing, and stripping into roof-drain clamping ring.
   1. Install stripping according to roofing manufacturer's written instructions.

3.9 COATING INSTALLATION

A. Apply coating to built-up roofing and base flashings according to manufacturer's written instructions, by spray, roller, or other suitable application method to provide a dry film thickness

of not less than 20 mils.

3.10 WALKWAY INSTALLATION

A. Walkway Pads: Install walkway pads using units of size indicated or, if not indicated, of manufacturer's standard size, according to walkway pad manufacturer's written instructions.
   1. Set walkway pads in additional pour coat of hot roofing asphalt after sweeping away loose aggregate surfacing.

B. Walkway Cap Sheet Strips: Install walkway cap sheet strips, approximately 36 inches wide and in lengths not exceeding 10 feet, leaving a space of 6 inches between strips, over built-up roofing. Adhere in hot roofing asphalt.

C. Roof-Paver Walkways: Install walkway roof pavers according to roofing manufacturer's written instructions in locations indicated, to form walkways. Leave 3 inches of space between adjacent roof pavers.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform roof tests and inspections and to prepare test reports.

B. Test Cuts: Test specimens will be removed to evaluate problems observed during quality-assurance inspections of built-up roofing as follows:
   1. Approximate quantities of components within built-up roofing will be determined according to ASTM D 3617.
   2. Test specimens will be examined for inter-ply voids according to ASTM D 3617 and to comply with criteria established in Appendix 3 of ARMA/NRCA's "Quality Control Guidelines for the Application of Built-up Roofing."
   3. Repair areas where test cuts were made according to roofing manufacturer's written instructions.

C. Repair or remove and replace components of built-up roofing where test results or inspections indicate that they do not comply with specified requirements.
   1. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.12 PROTECTING AND CLEANING

A. Protect built-up roofing from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove built-up roofing that does not comply with requirements, repair substrates, and repair or reinstall roofing to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.13 MEASUREMENT & PAYMENT

A. Unit Prices – SEE BID SHEET

B. Unit prices include surface preparation insulation, temporary covers and related materials.

C. The unit price for flashing at roof penetrations as pertains to the Work of this Section will not be applied to payment for other flashing work specified in other sections of work.

END OF SECTION 075113

SECTION 075323
ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Contract Documents apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Adhered EPDM membrane roofing system.
2. Mechanically fastened EPDM membrane roofing system.
3. Loosely laid and ballasted EPDM membrane roofing system.
4. Vapor retarder.
5. Roof insulation.

B. Section includes the installation of acoustical roof deck rib insulation strips furnished under Division 05 Section "Steel Decking."

C. Related Sections:
1. Division 05 Section "Steel Decking" for furnishing acoustical deck rib insulation.
2. Division 06 Section "Rough Carpentry and Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking; and for wood-based, structural-use roof deck panels.
3. Division 07 Section "Preparation for Re-Roofing" for recover board beneath new membrane roofing.
4. Division 07 Section "Thermal Insulation" for insulation beneath the roof deck.
5. Division 07 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
6. Division 07 Section "Manufactured Roof Expansion Joints" for proprietary manufactured roof expansion-joint assemblies.
7. Division 07 Section "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.3 DEFINITIONS

A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing

manufacturer based on testing and field experience.

C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.
   1. Corner Uplift Pressure: 42.3 lbf/sq. ft.
   2. Perimeter Uplift Pressure: 28 lbf/sq. ft.
   3. Field-of-Roof Uplift Pressure: 16.8 lbf/sq. ft.

D. Underwriters Laboratories® ("UL") Listing: Provide membrane roofing, base flashings, and component materials tested and listed by UL for application and indicated with UL "Class A" rating and Factory Mutual "Class I."

E. Retain "Solar Reflectance Index" Paragraph below if required for LEED-NC, LEED-CS, or LEED for Schools Credit SS 7.2. First option is minimum for roofs with slopes of 2:12 or less; second option is minimum for roofs with slopes steeper than 2:12.

F. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.

G. Energy Performance: Provide roofing system that is listed on the Department of Energy's ENERGY STAR "Roof Products Qualified Product List" for low and steep slope roof products.

H. Energy Performance: Provide roofing system with initial solar reflectance not less than 0.70 and emissivity not less than 0.75 when tested according to CRRC-1.

1.5 ACTION SUBMITTALS

A. Product Data: Submit product data for each type of product indicated in Part 2 of this Section.

B. LEED Submittals:
   1. Product Test Reports for Credit SS 7.2: For roof materials, documentation indicating that roof materials comply with Solar Reflectance Index requirement.
   2. Product Data for Credit IEQ 4.1: For adhesives and sealants used inside the weatherproofing system, documentation including printed statement of VOC content.
   3. Laboratory Test Reports for Credit IEQ 4: For adhesives and sealants used inside the weatherproofing system, documentation indicating that they comply with the testing and product requirements of the City, State, and Federal volatile organic compounds limitations.

C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
   1. Base flashings and membrane terminations.
   2. Tapered insulation, including slopes.
   3. Roof plan showing orientation of steel roof deck and orientation of membrane roofing and fastening spacings and patterns for mechanically fastened membrane roofing.
   4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

D. Samples for Verification: For the following products, in manufacturer's standard sizes:
   1. Sheet roofing, of color specified, including T-shaped side and end lap seam.
   2. Roof insulation.
   3. Ten (10) lb of aggregate ballast in gradation and color indicated.

4. Roof paver, 12” by 12”, in each color and texture required.
5. Walkway pads or rolls.
6. Termination bars.
7. Battens.
8. Six (6) insulation fasteners of each type, length, and finish.
9. Six (6) roof cover fasteners of each type, length, and finish.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: Submit reports that demonstrates capabilities and experience of the Installer and the manufacturer.

B. Manufacturer Certificate: Signed by roofing manufacturer certifying that membrane roofing system complies with Contract and performance requirements.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.

D. Research/Evaluation Reports: For components of membrane roofing system, from the ICC-ES.

E. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For membrane roofing system to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer that is UL listed for membrane roofing system.

B. Installer Qualifications: A firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

C. Source Limitations: Obtain components including roof insulation, fasteners for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.

D. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

E. Fire-Resistance Ratings: Where indicated, provide fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

F. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site. Review methods and procedure related to roofing including, but not limited to, the following:
   1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers

of roof accessories and roof-mounted equipment.

2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements for deck substrate conditions and finishes, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and Contract requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

G. Preinstallation Roofing Conference: Conduct conference at Project site. Review methods and procedure related to roofing installation including, but not limited to, the following:

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and Contract requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent

deflection of deck.

1.10 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.
   1. Warranty includes membrane roofing, base flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories, roof pavers, and other components of membrane roofing system.
   2. Warranty Period: Twenty (20) years from date of Substantial Completion.

B. Special Installer's Warranty: Submit roofing Installer's warranty, without monetary limitation, covering Work of this Section, including all components of membrane roofing system such as membrane roofing, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:
   1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2- PRODUCTS

2.1 EPDM MEMBRANE ROOFING

A. EPDM: ASTM D 4637, Type I, non-reinforced, Type II, scrim or fabric internally reinforced, uniform, flexible EPDM sheet.
   1. Manufacturers: Subject to compliance with Contract requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work:
      a. Carlisle SynTec Incorporated.
      b. ERSystems.
      c. Firestone Building Products.
      d. GAF Materials Corporation.
      e. GenFlex Roofing Systems.
      f. International Diamond Systems.
      g. Johns Manville.
      h. Mule-Hide Products Co., Inc.
      i. Protective Coatings, Inc.
      j. Roofing Products International, Inc.
      k. StaFast Building Products.
      l. Versico Incorporated.
      m. Or an Approved Equal.
   2. Thickness: 45 mils, 60 mils, 75 mils, 90 mils, nominal.
   3. Exposed Face Color: White on black.

B. Fabric-Backed EPDM: ASTM D 4637, Type III, non-reinforced, uniform, flexible EPDM sheet,

laminated to a nonwoven polyester fabric backing except at selvages.

1. Manufacturers: Subject to compliance with Contract requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work:
   a. Carlisle SynTec Incorporated.
   b. Versico Incorporated.
   c. Or an Approved Equal.
2. Composite Thickness: 90 mils, 100 mils, 105 mils, 115 mils, nominal.
3. Exposed Face Color: White on black.

2.2 AUXILIARY MEMBRANE ROOFING MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.
   1. Liquid-type auxiliary materials shall comply with VOC limits of City, State, and Federal authorities having jurisdiction.
   2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
      a. Plastic Foam Adhesives: 50 g/L.
      b. Gypsum Board and Panel Adhesives: 50 g/L.
      c. Multipurpose Construction Adhesives: 70 g/L.
      d. Fiberglass Adhesives: 80 g/L.
      e. Single-Ply Roof Membrane Adhesives: 250 g/L.
      f. Single-Ply Roof Membrane Sealants: 450 g/L.
      g. Nonmembrane Roof Sealants: 300 g/L.
      h. Sealant Primers for Nonporous Substrates: 250 g/L.
      i. Sealant Primers for Porous Substrates: 775 g/L.
      j. Other Adhesives and Sealants: 250 g/L.
   3. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the testing and product requirements of the City, State, and Federal volatile organic compounds limitations.

B. Sheet Flashing: 60-mil-thick EPDM, partially cured or cured, according to application.

C. Protection Sheet: Epichlorohydrin or neoprene non-reinforced flexible sheet, 55- to 60-mil-thick, recommended by EPDM manufacturer for resistance to hydrocarbons, non-aromatic solvents, grease, and oil.

D. Bonding Adhesive: Manufacturer's standard**,** water based.

E. Modified Asphaltic Fabric-Backed Membrane Adhesive: Roofing system manufacturer's standard modified asphalt, asbestos-free, cold-applied adhesive formulated for compatibility and use with fabric-backed membrane roofing.

F. Water-Based, Fabric-Backed Membrane Adhesive: Roofing system manufacturer's standard water-based, cold-applied adhesive formulated for compatibility and use with fabric-backed membrane roofing.

G. Low-Rise, Urethane, Fabric-Backed Membrane Adhesive: Roof system manufacturer's standard spray-applied, low-rise, two-component urethane adhesive formulated for compatibility and use

with fabric-backed membrane roofing.

H. Seaming Material: Single-component, butyl splicing adhesive and splice cleaner. Manufacturer's standard, synthetic-rubber polymer primer and 3-inch-wide minimum, butyl splice tape with release film.

I. Lap Sealant: Manufacturer's standard, single-component sealant**,** colored to match membrane roofing.

J. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.

K. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8-inch-thick; with anchors.

L. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, prepunched.

M. Fasteners: Factory-coated steel fasteners and metal or plastic plates must be corrosion-resistance, designed for fastening membrane to substrate, acceptable to roofing system manufacturer, and tested and listed by UL for application indicated with UL "Class A" rating and Factory Mutual "Class I."

N. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, reinforced EPDM securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

O. Liquid coating, specifically formulated for coating EPDM membrane roofing, as follows:
1. Type: Acrylic emulsion or Hypalon.
2. Color: White, Gray, Tan, or as selected by Architect from manufacturer's full range.

2.3 SUBSTRATE BOARDS

A. Substrate Board: ASTM C 1396/C 1396M, Type X gypsum board, 5/8 inch thick.

B. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/4- inch, 1/2-inch, Type X, 5/8 inch thick.
1. Products: Subject to compliance with Contract requirements, provide one of the following available products that may be incorporated into the Work:
a. Georgia-Pacific Corporation; Dens Deck.
b. Or an Approved Equal.

C. Substrate Board: ASTM C 1278/C 1278M, cellulosic-fiber-reinforced, water-resistant gypsum substrate, 1/4-inch, 3/8-inch, 1/2-inch, 5/8 inch thick.
1. Products: Subject to compliance with Contract requirements, provide one of the following available products that may be incorporated into the Work:
a. USG Corporation; Securock.
b. Or an Approved Equal.

D. Substrate Board: ASTM C 728, perlite board, 3/4-inch, 1 inch thick, seal coated.

E. Fasteners: Factory-coated steel fasteners and metal or plastic plates must be corrosion-resistance,

designed for fastening substrate panel to roof deck, and tested and listed by UL for application indicated with UL “Class A” rating and Factory Mutual “Class I”.

2.4 VAPOR RETARDER

A. Polyethylene Film: ASTM D 4397, 6 mils thick, minimum, with maximum permeance rating of 0.13 perm.
   1. Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
   2. Adhesive: Manufacturer's standard lap adhesive that have been tested and listed by UL for vapor-retarder application indicated with UL “Class A” rating and Factory Mutual “Class I.”

B. Laminated Sheet: Kraft paper, two layers, laminated with asphalt and edge reinforced with woven fiberglass yarn with maximum permeance rating of 0.50 perm and with manufacturer's standard adhesive.

C. Glass-Fiber Felts: ASTM D 2178, Type IV, asphalt impregnated.

2.5 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured Or an Approved Equal by EPDM membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated approvals-approved roof insulation.

B. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, 1.6-lb/cu. ft., Type X, 1.3-lb/cu. ft. minimum density, square edged.

C. Molded-Polystyrene Board Insulation: ASTM C 578, Type II, 1.35-lb/cu. ft., Type VIII, 1.15-lb/cu. ft., Type IX, 1.8-lb/cu. ft. minimum density.

D. Composite Molded-Polystyrene Board Insulation: ASTM C 578, Type II, 1.35-lb/cu. ft. Type VIII, 1.15-lb/cu. ft., Type IX, 1.8-lb/cu. ft. minimum density, with factory-applied facings, as follows:
   1. Facer: ASTM C 208, Type II, Grade 2, cellulosic-fiber insulation board, asphalt coated, 1/2 inch thick.
   2. Facer: DOC PS 2, Exposure 1, OSB, 7/16 inch thick.

E. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2 and Type II, Class I, Grade 3, felt or glass-fiber mat facer on both major surfaces.

F. Composite Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2 with factory-applied facing board on one major surface, as indicated below by type, and felt or glass-fiber mat facer on the other.
   1. Type IV, cellulosic-fiber-insulation-board facer, Grade 2, 1/2 inch thick.
   2. Type V, OSB facer, 7/16 inch thick.
   3. Type VII, glass mat faced gypsum board facer, 1/4 inch thick.

G. Perlite Board Insulation: ASTM C 728, rigid, mineral-aggregate thermal insulation board composed of expanded perlite, cellulosic fibers, binders, and waterproofing agents with top

surface seal coated.

H. Cellulosic-Fiber Board Insulation: ASTM C 208, Type II, Grade 2, fibrous-felted, rigid insulation boards of wood fiber or other cellulosic-fiber and water-resistant binders, asphalt impregnated, chemically treated for deterioration.

I. Cellular-Glass Board Insulation: ASTM C 552, Type IV, rigid, cellular-glass thermal board insulation faced with manufacturer's standard kraft-paper sheets.

J. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches unless otherwise indicated.

K. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.6 INSULATION ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates must be corrosion-resistance, designed for fastening roof insulation and cover boards to substrate, acceptable to roofing system manufacturer, and tested and listed by UL for application indicated with UL “Class A” rating and Factory Mutual “Class I”.

C. Modified Asphaltic Insulation Adhesive: Insulation manufacturer's recommended modified asphalt, asbestos-free, cold-applied adhesive formulated to attach roof insulation to substrate or to another insulation layer.

D. Bead-Applied Insulation Adhesive: Insulation manufacturer's recommended bead-applied, low-rise, one- or multicomponent urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.

E. Full-Spread Applied Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.

F. Cover Board: ASTM C 208, Type II, Grade 2, cellulosic-fiber insulation board, 1/2 inch thick.

G. Cover Board: DOC PS 2, Exposure 1, OSB, 7/16 inch thick.

H. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/4-inch, 1/2 inch, and 5/8-inch-thick, factory primed.
   1. Products: Subject to compliance with Contract requirements, provide one of the following available products that may be incorporated into the Work:
      a. Georgia-Pacific Corporation; Dens Deck, Dens Deck Prime, and Dens Deck DuraGuard.
      b. Or an Approved Equal.

I. Cover Board: ASTM C 1278/C 1278M, cellulosic-fiber reinforced, water-resistant gypsum substrate, 1/4-inch, 3/8-inch, 1/2 inch, and 5/8 inch thick.
   1. Products: Subject to compliance with Contract requirements, provide one of the following

available products that may be incorporated into the Work:
a. USG Corporation; Securock.
b. Or an Approved Equal.

J. Protection Mat: Woven or nonwoven polypropylene, polyolefin, or polyester fabric, water permeable and resistant to UV degradation, type and weight as recommended by roofing system manufacturer for application.

2.7 ASPHALT MATERIALS

A. Roofing Asphalt: ASTM D 312, Type III or Type IV.

B. Asphalt Primer: ASTM D 41.

2.8 AGGREGATE BALLAST

A. Aggregate Ballast: Provide aggregate ballast that will withstand weather exposure without significant deterioration and will not contribute to membrane degradation, of the following type and size:
1. Aggregate Type: Smooth, washed, riverbed gravel or other acceptable smooth-faced stone and Crushed gravel or crushed stone.
2. Size: ASTM D 448, Size 4, ranging in size from 3/4 to 1-1/2 inches.
3. Size: ASTM D 448, Size 2, ranging in size from 1-1/2 to 2-1/2 inches.
4. Size: ASTM D 448, Size 3, ranging in size from 1 to 2 inches.

2.9 ROOF PAVERS

A. Lightweight Roof Pavers: Interlocking, lightweight concrete units, specially factory cast for use as roof ballast; grooved back, with four-way drainage capability; beveled, doweled, or otherwise profiled; and as follows:
1. Manufacturers: Subject to compliance with Contract requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work:
a. Hanover Architectural Products.
b. Rapid Building Systems.
c. Roofblok Limited.
d. Westile Roofing Products.
e. Or an Approved Equal.
2. Size: 24 by 24 by 2-1/4 inches
3. Weight: 16.6 lbs/sq.
4. Compressive Strength: 3500 psi, minimum.
5. Colors and Textures: As selected by Architect from manufacturer's full range.

B. Rubber Roof Pavers: Interlocking, lightweight rubber units, 24 by 24 by 2-1/4 inches, 6 lb/sq. ft specially manufactured for use as roof ballast; with grooved back for four-way drainage, beveled and doweled; and as follows:
1. Products: Subject to compliance with Contract requirements, provide one of the following available products that may be incorporated into the Work:
a. Carlisle SynTec Incorporated; Interlocking Rubber Paver.
b. Or an Approved Equal.
2. Perimeter Securement Strip: Manufacturer's standard coated aluminum sheet hold down,

in color selected by Architect; and fasteners.

3. Color: Black, Gray, Terra cotta or as per contract drawings.

C. Heavyweight Roof Pavers: Heavyweight, hydraulically pressed, concrete units, with top edges beveled 3/16-inch, factory cast for use as roof pavers; absorption not greater than five (5) percent, ASTM C 140; no breakage and maximum one (1) percent mass loss when tested for freeze-thaw resistance, ASTM C 67; and as follows:

1. Manufacturers: Subject to compliance with Contract requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work:
   a. Hanover Architectural Products.
   b. Rapid Building Systems.
   c. Roofblok Limited.
   d. Sunny Brook Pressed Concrete.
   e. Wausau Tile, Inc.; Terra-Paving Division.
   f. Westile Roofing Products.
   g. Or an Approved Equal.
2. Size: 24 by 24 inches. Manufacture pavers to dimensional tolerances of plus or minus 1/16 inch in length, height, and thickness.
3. Weight: 22 lb/sq. ft.
4. Compressive Strength: 6500 psi, minimum.
5. Colors and Textures: As selected by Architect from manufacturer's full range.

2.10 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16-inch-thick, and acceptable to membrane roofing system manufacturer.

B. Walkway Roof Pavers: Heavyweight, hydraulically pressed, concrete units, with top edges beveled 3/16-inch, factory cast for use as roof pavers; absorption not greater than five (5) percent, ASTM C 140; no breakage and maximum one (1) percent mass loss when tested for freeze-thaw resistance, ASTM C 67; and as follows:

1. Manufacturers: Subject to compliance with Contract requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work:
   a. Hanover Architectural Products.
   b. Rapid Building Systems.
   c. Roofblok Limited.
   d. Sunny Brook Pressed Concrete.
   e. Wausau Tile, Inc.; Terra-Paving Division.
   f. Westile Roofing Products.
   g. Or an Approved Equal.
2. Size: 24 by 24 inches. Manufacture pavers to dimensional tolerances of plus or minus 1/16 inch in length, height, and thickness.
3. Weight: 18 lb/sq. ft. to 22 lb/sq. ft.
4. Compressive Strength: 6500 psi, minimum.
5. Colors and Textures: As selected by Architect from manufacturer's full range.

PART 3- EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
   1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
   2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
   3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 05 Section "Steel Decking."
   4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
   5. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
   6. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.

B. Proceed with installation only after above mentioned conditions have been verified.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

D. Install acoustical roof deck rib insulation strips, specified in Division 05 Section "Steel Decking," according to acoustical roof deck manufacturer's written instructions, immediately before installation of overlying construction and to remain dry.

3.3 SUBSTRATE BOARD

A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
   1. Fasten substrate board to top flanges of steel deck must be tested and listed by UL for application indicated with UL “Class A” rating and Factory Mutual “Class I.”
   2. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to membrane roofing system manufacturers' written instructions.

3.4 VAPOR-RETARDER INSTALLATION

A. Polyethylene Film: Loosely lay polyethylene-film vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 inches and 6 inches, respectively.

1. Continuously seal side and end laps with tape or adhesive.

B. Laminate Sheet: Install laminate-sheet vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 inches and 6 inches, respectively. Bond vapor retarder to substrate as follows:
   1. Apply adhesive at rate recommended by vapor-retarder manufacturer. Seal laps with adhesive.
   2. Apply ribbons of hot roofing asphalt at spacing, temperature, and rate recommended by vapor-retarder manufacturer. Seal laps with hot roofing asphalt.

C. Built-Up Vapor Retarder: Install two glass-fiber felt plies lapping each felt 19 inches over preceding felt. Embed each felt in a solid mopping of hot roofing asphalt. Glaze-coat completed surface with hot roofing asphalt. Apply hot roofing asphalt within plus or minus 25 deg F of equiviscous temperature.

D. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system.

3.5 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components, so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two (2) or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of six (6) inches in each direction.
   1. Where installing composite and noncomposite insulation in two (2) or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
   1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

G. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:
   1. Prime surface of concrete deck with asphalt primer at rate of 3/4 gal./100 sq. ft. and allow primer to dry.
   2. Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.
   3. Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
   4. Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly

pressing and maintaining insulation in place.

H. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
   1. Insulation and mechanical fasteners tested and listed by UL for application indicated with UL “Class A” rating and Factory Mutual “Class I.”
   2. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

I. Mechanically Fastened and Adhered Insulation: Install first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
   1. Insulation and mechanical fasteners tested and listed by UL for application indicated with UL “Class A” rating and Factory Mutual “Class I.”
   2. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
   3. Set each subsequent layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.
   4. Set each subsequent layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
   5. Set each subsequent layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

J. Loosely Laid Insulation: Loosely lay insulation units over substrate.

K. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and fasten to roof deck.
   1. Cover boards and joints tested and listed by UL for application indicated with UL “Class A” rating and Factory Mutual “Class I.”
   2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

3.6 ADHERED MEMBRANE ROOFING INSTALLATION

A. Adhere fabric-backed membrane roofing over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll membrane roofing and allow to relax before installing.

B. Start installation of membrane roofing in presence of membrane roofing system manufacturer's technical personnel.

C. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.

E. Hot Roofing Asphalt: Apply a solid mopping of hot roofing asphalt to substrate at temperature and rate required by manufacturer and install fabric-backed membrane roofing. Do not apply to splice area of membrane roofing.

F. Fabric-Backed Membrane Adhesive: Apply to substrate at rate required by manufacturer and install fabric-backed membrane roofing.

G. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeters.

H. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

I. Adhesive Seam Installation: Clean both faces of splice areas, apply splicing cement, and firmly roll side and end laps of overlapping membrane roofing according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of membrane roofing terminations.

1. Apply a continuous bead of in-seam sealant before closing splice if required by membrane roofing system manufacturer.

J. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping membrane roofing according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of membrane roofing terminations.

K. Repair tears, voids, and lapped seams in roofing that does not comply with Contract requirements.

L. Spread sealant or mastic bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

M. Install membrane roofing and auxiliary materials to tie in to existing membrane roofing to maintain weather-tightness of transition and to not void warranty for existing membrane roofing system.

N. Adhere protection sheet over membrane roofing at locations indicated.

3.7 MECHANICALLY FASTENED MEMBRANE ROOFING INSTALLATION

A. Mechanically fasten membrane roofing over area to receive roofing according to roofing system manufacturer's written instructions. Unroll membrane roofing and allow to relax before installing.

1. For in-splice attachment, install membrane roofing with long dimension perpendicular to steel roof deck flutes.

B. Start installation of membrane roofing in presence of roofing system manufacturer's technical personnel.

C. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Mechanically fasten or adhere membrane roofing securely at terminations, penetrations, and perimeter of roofing.

E. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

F. Adhesive Seam Installation: Clean both faces of splice areas, apply splicing cement, and firmly roll side and end laps of overlapping membrane roofing according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of

membrane roofing terminations.

1. Apply a continuous bead of in-seam sealant before closing splice if required by membrane roofing system manufacturer.

G. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping membrane roofing according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of membrane roofing terminations.

H. Repair tears, voids, and lapped seams in roofing that does not comply with Contract requirements.

I. Spread sealant or mastic bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

J. In-Splice Attachment: Secure one edge of membrane roofing using fastening plates or metal battens centered within membrane splice and mechanically fasten membrane roofing to roof deck. Field splice seam.

K. Through-Membrane Attachment: Secure membrane roofing using fastening plates or metal battens and mechanically fasten membrane roofing to roof deck. Cover battens and fasteners with a continuous cover strip.

L. Install membrane roofing and auxiliary materials to tie in to existing roofing to maintain weather-tightness of transition and to not void warranty for existing membrane roofing system.

M. Adhere protection sheet over membrane roofing at locations indicated.

3.8 LOOSELY LAID AND BALLASTED MEMBRANE ROOFING INSTALLATION

A. Loosely lay membrane roofing over area to receive roofing according to roofing system manufacturer's written instructions. Unroll membrane roofing and allow to relax before installing.
   1. Comply with requirements in SPRI RP-4 for System 1, System 2, and System 3.

B. Start installation of membrane roofing in presence of roofing system manufacturer's technical personnel.

C. Accurately align membrane roofing, without stretching, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Mechanically fasten or adhere perimeter of membrane roofing according to requirements in SPRI RP-4.

E. Mechanically fasten or adhere membrane roofing at corners, perimeters, and transitions according to requirements in SPRI RP-4.
   1. At corners and perimeters, omit aggregate ballast leaving membrane roofing exposed.
   2. At corners and perimeters, adhere a second layer of membrane roofing

F. Apply membrane roofing with side laps shingled with slope of deck where possible.

G. Adhesive Seam Installation: Clean both faces of splice areas, apply splicing cement, and firmly roll side and end laps of overlapping membrane roofing according to manufacturer's written

instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of membrane roofing terminations.

1. Apply a continuous bead of in-seam sealant before closing splice if required by membrane roofing system manufacturer.

H. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping membrane roofing according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of membrane roofing terminations.

I. Leave seams uncovered until inspected by membrane roofing system manufacturer testing agency.

J. Repair tears, voids, and lapped seams in roofing that does not comply with Contract requirements.

K. Spread sealant or mastic bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

L. Install membrane roofing and auxiliary materials to tie in to existing roofing to maintain weather-tightness of transition and to not void warranty for existing membrane roofing system.

M. Adhere protection sheet over membrane roofing at locations indicated.

N. Install protection mat over membrane roofing, overlapping a minimum of 6 inches. Install an additional protection mat layer at projections, pipes, vents, and drains, overlapping a minimum of 12 inches.

O. Aggregate Ballast: Apply uniformly over membrane roofing at the rate required by membrane roofing system manufacturer, but not less than the following, spreading with care to minimize possibility of damage to membrane roofing system. Lay ballast as membrane roofing is installed, leaving membrane roofing ballasted at the end of the workday.

1. Ballast Weight: Size 4 aggregate, 10 lb/sq. ft.
2. Ballast Weight: Size 2 aggregate, 13 lb/sq. ft, at corners and perimeter; Size 4 aggregate, 10 lb/sq. ft., elsewhere.
3. Ballast Weight: Size 2 aggregate, 13 lb/sq. ft.
4. Ballast Weight: Size 3 aggregate, 112.5 lb/sq. ft at corners, 11.5 lb/sq. ft at perimeter, and 11 lb/sq. ft, elsewhere.

P. Roof-Paver Ballast: Install heavyweight roof-paver ballast according to manufacturer's written instructions.

Q. Roof-Paver Ballast: Install rubber roof-paver ballast according to manufacturer's written instructions, in locations indicated.

1. Install perimeter paver edge securement.

R. Roof-Paver and Aggregate Ballast: Install heavyweight roof pavers according to manufacturer's written instructions on roof corners and perimeter.

1. Install Size 4 aggregate ballast elsewhere on roofing at a minimum rate of 10 lb/sq. ft.
2. Install Size 2 aggregate ballast elsewhere on roofing at a minimum rate of 13 lb/sq. ft.

3.9 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.10 COATING INSTALLATION

A. Apply coatings to membrane roofing and base flashings according to manufacturer's written recommendations, by spray, roller, or other suitable application method.

3.11 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

B. Roof-Paver Walkways: Install walkway roof pavers according to manufacturer's written instructions in locations indicated, to form walkways. Leave three (3) inches of space between adjacent roof pavers.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing agency to perform inspections.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

C. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

D. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.13 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.14 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

B. Above unit prices include all required surface

END OF SECTION 075323

SECTION 075760
MECHANICAL ROOM WATERPROOFING

PART 1- GENERAL

1.1 SUMMARY

A. Section includes: Provide a complete polyurethane waterproofing coating system where indicated on the Drawings, including all applicable sealants and elastomeric flashings needed to ensure a complete waterproof and weathertight system for deck, ramp, stair and landing surfaces at locations indicated.

1.2 SUBMITTALS

A. Product data:
   1. Materials list of items proposed to be provided under this Section;
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
   3. Shop Drawings or catalog illustrations in sufficient detail to show installation and interface of the work of this Section with the work of adjacent trades;
   4. Manufacturer's current recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.
   5. Written documentation of applicator's qualifications, including reference projects of similar scope and complexity, with current phone contacts of architects and owners for verification.

1.3 REFERENCES

A. General: Comply with the applicable provisions of the references, except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
   1. American Society for Testing and Materials (ASTM)
      a. ASTM C811 “Standard Practice for Surface Preparation of Concrete for Application of Chemical-Resistant Resin Monolithic Surfacings.”

1.4 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

B. Applicator qualifications:
   1. Applicator shall have at least three years’ experience in installing materials of types specified and shall have successfully completed at least three projects of similar scope and complexity.
   2. Applicator shall designate a single individual as project foreman who shall be always on

site during installation.

C. Examine Drawings and Specifications affecting work of this Section, verify all conditions, review installation procedures, and coordinate scheduling with interfacing portions of the Work.

D. Single Source Responsibility: Obtain primary fluid applied flooring materials including primers, resins, waterproofing membranes, hardening agents, finish or sealing coats from a single manufacturer with not less than five (5) years of successful experience in supplying principal materials for work of type and extent shown and described in this section. Provide secondary materials only of type and from source recommended by manufacturer of primary materials.

E. Installer: A firm with a minimum of five (5) years successful experience in the installation of the specified materials in similar designs and extent to those indicated whose work has resulted in applications with a record of successful in-service performance and who are approved by the fluid applied flooring manufacturer. Engage an installer who employs only persons trained and approved by resinous flooring manufacturer for applying specified systems indicated.

F. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from authorities having jurisdiction.

G. Pre-Installation Meeting: Prior to the installation, meet at the project site to review the material selections, substrate preparations, installation procedures, coordination with other trades, special details and conditions, standard of workmanship, and other pertinent topics related to the Work.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to job site in manufacturer's unopened containers with all labels intact and legible at time of use.

B. Maintain the products in accord with manufacturer's recommendations with proper precautions to ensure fitness of material when installed.

1.6 SUBSTRATE CONDITIONS

A. General:
   1. Provide applicator with surfaces that are broom clean, dry, sound and free of voids, bugholes, rock pockets, honeycombs, protrusions, excessive roughness, foreign matter, frost, ice and other contaminants which may inhibit application or performance of the waterproofing coating system.
   2. Using suitable abrasive methods, remove residue of form release, curing compound, chemical retarders and other surface treatments, laitance, mortar smear, sawcutting residue, mill scale, rust, loose material and other contaminants from concrete, masonry and ferrous metal surfaces to receive the work of this Section.

B. Concrete: Where work of this Section will be applied to concrete, provide surfaces that are smooth with finish equal to one that is light steel troweled followed by a fine hair broom.

C. Decks:
   1. Slope deck surfaces to drains that have flanges at coating level which are flush with deck surfaces.
   2. Rigidly install pipe, vents and other surface protrusions, properly flash them, and cover to prevent entry of coating materials.

D. Metal flashings: Where metal flashings are substrate to waterproofing coating, set the flashings in continuous bedding bead of urethane sealant; install sealant S-bead between metal laps and mechanically fasten to substrate along leading edges at every 4" on center, staggered linearly, to lay flat without fishmouths.

E. Joints: Configuration shall be consistent with this Section and with all other requirements of the Contract Documents.

F. Environmental Conditions: Comply with resinous flooring manufacturer's directions for maintenance of ambient and substrate temperature, moisture, humidity, ventilation, and other conditions required to execute and protect Work.

1.7 GUARANTEES

A. The Contractor shall provide the following written guarantees for the installed waterproof coating system:
   1. Manufacturer's standard guarantee covering materials- Five (5) years; and
   2. Applicator's standard guarantee covering workmanship- Five (5) years.

Should any defects occur during the stated period, they shall be corrected immediately, and all damage caused by such defects shall be corrected. Defects shall include, but not be limited to, adhesive failure, cohesive failure, weathering deficiencies and waterproofing failure resulting from substrate cracking up to 1/16 inch. All corrective work shall be at the Contractor's expense. The Guarantee Period shall commence upon final acceptance of the work.

PART 2- PRODUCTS

2.1 GENERAL

A. Provide a complete "Vulkem 360NF/Vulkem 950NF" Mechanical Room Coating System or Vulkem, 360NF/950NF/951NF HD Mechanical Room System liquid applied polyurethane waterproofing coating system manufactured by Tremco Inc. (800) 312-7906 and having the following minimum attributes:
   1. System designed for waterproofing decks subject to mechanical room traffic.
   2. Complying with ASTM C957-91 and having a Class A fire rating on concrete substrates.
   3. Color to be selected by Architect from manufacturer's standard color range.

B. Or an Approved Equal.

2.2 ACCESSORIES

A. Primer: As recommended by coating system manufacturer.
B. Joint backing: Closed-cell, polyethylene rod as recommended by coating manufacturer.

C. Aggregate: “Glass Sand” 90 Mesh Feldspar Slica Quartz Aggregate or 30-60 Felspar as noted for system and approved in mock-up.

D. Sealant: As recommended by coating manufacturer. Vulkem 116, Dymeric 240FC.

E. Or an Approved Equal.

2.3 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor and approved by the coating system manufacturer as compatible, subject to the approval of the Architect.

2.4 MATERIALS

A. Mechanical Equipment Flooring: A seamless multi-component flooring system consisting of a primer, a reinforced waterproof membrane, a trowel applied cementitious body coat, fillers and a finish color sealer topcoat complete with trowelled-in graded aggregate. Minimum total thickness: 3/16 in. Provide one of the following:
   1. Permalith MER with Epo-Flex Waterproofing Membrane” (General Polymers).
   2. "Traffic Membrane I with Waterproofing Membrane " (Selby Ucrete, Division of Degussa Building Systems).
   3. "Dex-O-Tex, M-E Floor #103 with Waterproofing Membrane " (Crossfield Products Corp.).
   4. Or an Approved Equal.

B. Sealcoat Color: Colors of fluid applied floorings shall be as selected by the Consultant from the manufacturer's standard range.

2.5 SUPPLEMENTAL MATERIALS

A. Flashing, Sheets, Cant Strips and Accessories: Types as recommended by flooring materials manufacturer, supplied for locations indicated and for locations recommended by manufacturer.

PART 3- EXECUTION

3.1 GENERAL

A. Manufacturer's Instructions: Prepare substrates, apply primers and apply the work of this Section, including components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance

of the Work.

3.2 EXAMINATION

A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

B. Repair: Repair damaged and deteriorated concrete and verify that concrete substrates are dry.

3.3 SURFACE CONDITIONS

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Applicator shall examine the areas and conditions under which work of this Section will be performed.
   1. Verify conformance with manufacturer's requirements;
   2. Report unsatisfactory conditions in writing to the Architect;
   3. Do not proceed until unsatisfactory conditions are corrected.

3.4 PREPARATION

A. Surface preparation and detailing procedures to be in accord with waterproof coating system manufacturer's instructions and recommendations except where more stringent requirements are indicated.

B. Clean all deck surfaces to receive coating system in accord with manufacturer's instructions; vacuum clean or blow clean with oil-free compressed air all surfaces to receive sealants, detailing materials or coatings immediately prior to installation.

C. Rout, clean, prepare and detail surface cracks in accord with manufacturer's instructions; install backer rod where required.

D. Clean metal surfaces to bright metal by wire brushing or mechanical etching; scuff- sand lead flashing and plastic surfaces.

E. Prime surfaces in accord with manufacturer's instructions only as required or recommended by the manufacturer.

F. Install 1/4" diameter backer rod into corner of all horizontal-to-vertical junctures subject to movement and cover with 1" detail cant of approved sealant; install 1" detail cants at projections, curbs and other horizontal-to-vertical junctures.

G. Install detail coats, joint and crack treatments, and liquid flashings in accord with manufacturer's instructions.

H. Allow detail applications to cure in accord with manufacturer's instructions prior to general application of coating.

I. Substrate: Perform preparation and cleaning procedures according to flooring manufacturer's instructions for particular substrate conditions involved, and as specified. Provide clean, dry, and neutral substrate for flooring application.

J. Concrete Surfaces: Comply with ASTM C811 "Standard Practice for Surface Preparation of Concrete for Application of Chemical-Resistant Resin Monolithic Surfacings".
   1. Concrete Preparation: Clean and prepare the substrate so that it is free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring. Grind and fill concrete surfaces as required to meet pre-installation tolerances. Mechanically scarify concrete substrate by sandblasting, grinding or portable shot blast cleaning system as may be required to provide a proper surface or to remove curing compounds or other surface contaminants that would interfere with proper bond of system.
   2. Concrete Testing: Verify that concrete substrates are dry. Perform moisture in concrete test in accordance with ASTM D 4263 “Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method”. Proceed with application only after testing indicates absence of moisture in substrates. Perform additional moisture tests as required. Proceed with application only after substrates pass testing.
   3. Ph Testing: Verify that concrete substrates have neutral Ph and that resinous flooring will adhere to them. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

K. Primer: Apply primer to substrates. Coordinate timing of primer application with application of topping mix to insure optimum adhesion between resinous flooring materials and substrate.

L. Coordination: Coordinate the installation of fluid applied flooring with floor drains, equipment bases, curbs, and other adjacent work. Mask adjacent work to prevent soil marks.

3.5 APPLICATION (for Vulkem System), follow manufacturer applications for an Approved Equal

A. Verify proper dry condition of substrate using method recommended by coating system manufacturer; perform adhesion checks prior to general application of coating system using field adhesion test method recommended by manufacturer.

B. Mask off adjoining surfaces not to receive coating system.

C. Wipe clean all detail coats with white rags wetted with Xylene solvent; do not saturate detail coat.

D. Apply coating base coat and top uniformly, do not allow coatings to pond and allow to cure in accord with manufacturer's instructions.

E. Feather terminating edge when entire area cannot be completed in one day; clean area 6" wide along terminating edge of coating with Xylene solvent on clean white rags prior to startup on next working day; use interlaminary primer per manufacturer's instructions as needed;

overlap existing work by 6" with new work.

F. Install waterproof coating system in accord with manufacturer's recommendations and instructions as applies to the Work except where more stringent requirements are indicated:
   1. Grid deck surfaces to assure proper coverage rates and verify coating wet-film mil thickness with gauges as work progresses.
   2. Retain empty product containers during course of work to aid in determining whether completed coating system complies with manufacturers average thickness requirements.
   3. Application of Vulkem 360NF/950NF or approved equal Mechanical Room System Standard Duty.
   4. Complete all detail work as noted in standard system application instructions. Install base coat at the rate of 40 mils Mechanical Room Application Instructions.
   5. Apply top coat of Vulkem 950 or approved equal at a rate of 125 square feet per gallon (thinning may be required contact manufacturer for instructions for thinning) and while wet broadcast 90 mesh aggregate to rejection. Do not over broadcast. Allow to cure for 4-6 hours minimum. Sweep up any excess aggregate.
   6. Application of 360NF/950NF/951NF Heavy Duty, Or an Approved Equal, Mechanical Room Coating for Exterior Applications.
   7. Complete all detail work as noted in standard system application instructions. Install base coat at 40 mils thickness.
   8. Apply Vulkem 950NF or approved equal at the rate of 125 square feet per gallon while wet broacast 30-60 Felspar Silica quartz aggregate to rejection. After cure sweep up any excess aggregate.
   9. Apply Vulkem 951NF Topc o a t at the rate of 125 mils per gallon. While wet broadcast 30-60 Felspar Silica quartz to rejection. Follow the manufacturer’s instructions for applications.
   10. Or an Approved Equal.

3.6 INSTALLATION

A. General: The mixing, placing, finishing, and curing of the fluid applied flooring shall produce a uniform monolithic wearing surface of thickness required, uninterrupted except at divider strips, sawn joints or other types of joints (if any), indicated or required. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through fluid applied flooring. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.

B. Trowelled Application of Topping Mix: Trowel apply topping mix including fine aggregates or fillers over freshly applied primer in number of coats and at spreading rates required to produce minimum thickness required Check thickness at frequent and regular intervals. Perform finish troweling as work proceeds. Remove trowel marks by power sanding.

C. Grout Coat: If required, after topping mix has cured sufficiently, apply grout coat of type required to fill topping mix in number of coats and spreading rates to produce a uniform surface.

D. Finish or Sealing Coat: Apply finish or sealing coats of type required to produce non- slip finish.

E. Cove Base: Apply floor system to wall surfaces at locations shown to form base with cove or radius shown and a height of 4 in. unless otherwise indicated. Apply prior to installation of floor surfaces. Round interior and external corners.

F. Edge Strip Installation: Install metal edge strips in continuous lengths at edges of fluid applied flooring and bases, unless otherwise shown. Anchor strips solidly to substrate with countersunk non-magnetic stainless-steel screws; space anchors 1 in. from each end and not more than 9 in. on centers at intermediate points. Install strips before priming substrate.

G. Extend flooring into recesses, floor drain, over mechanical equipment bases, and under equipment in the spaces shown to receive fluid applied flooring. Include integral cove bases, raised bases and depressions to form a complete monolithic covering without interruptions or seams. Place and finish flooring neatly around obstructions, in a manner that will achieve uniform color and texture throughout.

H. Patch fluid applied flooring applied over equipment boxes following equipment installation, as required maintaining monolithic waterproof integrity.

I. Provide non-slip textures where indicated. Provide colors and textures as selected by the Consultant.

J. Curing: Cure resinous flooring materials taking care to prevent contamination during stages of application and prior to completion of curing process.

3.7 FIELD QUALITY CONTROL

A. Subcontractor's Quality Control Responsibilities: Subcontractor is solely responsible for quality control of the Work.

B. Test installation for leaks immediately after nominal cure of the completed flooring. Flood each area to a depth of one inch for 24 hours. Repair all leaks and repeat test until no leakage is observable.

C. Compliance: If test results show applied materials do not comply with specified requirements, pay for testing, remove non-complying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

D. Material Sampling: The Owner may at any time and any number of times during resinous flooring application require material samples for testing for compliance with requirements.

E. Core Sampling: When directed at locations designated, take 1 core sample per 1000 ft.2 of resinous flooring, or portion of, to verify thickness. For each sample that fails to comply with requirements, take two additional samples. Repair damage caused by coring and correct deficiencies.

3.8 PROTECTION AND CLEAN-UP

A. Promptly remove primer or coating material with MEK, Toluene or Xylene; or an Approved Equal; leave work area in broom clean condition.

B. Allow completed Work to cure 24 hours before opening to pedestrian traffic.

C. Cure resinous flooring materials according to manufacturer's directions, taking care to prevent contamination during application stages and before completing curing process. Close application area for a minimum of 24 hours.

3.9 PROTECTION

A. Protect fluid applied flooring throughout the construction period so that it will be without indication of use or damage at the time of acceptance by the Owner.

3.10 MEASUREMENT AND PAYMENT

A. Unit Price – SEE BID SHEET

END OF SECTION 075760

SECTION 076200
SHEET METAL FLASHING AND TRIM

PART 1- GENERAL

1.1 SUMMARY

A. Work Included Provide flashing and sheet metal in accordance with the Contract Documents. The Work of this Section shall include but not be limited to the following:
   1. Metal counter flashing; and base flashing

1.2 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the sheet metal work, as indicated on the drawings and/ or specified herein, including but not limited to, the following:
   1. Stainless steel cap metal flashing.
   2. Stainless steel through wall flashing.
   3. Field fabricating (including bending, cutting, soldering, etc.), if required, of stainless-steel flashing.
   4. Stainless steel flashing elsewhere, where metal flashing is indicated on drawings.
   5. Separation of contacting surfaces of dissimilar metals.

1.4 RELATED SECTIONS

A. Unit masonry – Section 042000.

B. Product Data: Submit manufacturer’s product data, installation instructions and general recommendations for each specified sheet material and fabricated product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles and finishes for each manufactured product and accessory.

C. Shop Drawings: Submit shop drawings showing layout, joining, profiles, and anchorages of fabricated work, including major counter-flashings, scuppers and coping; layouts at 1/4” scale, details at 3” scale.

D. Samples: Submit 12" x 12" samples of flashing materials and finishes.

E. Sheet metal flashing and trim shall have a minimum of 20% post-consumer recycled content.

1.5 REFERENCES

A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.

1. International Nickel Company: "Stainless Steel Roofing, Flashing and Accessories Volume 3."
2. National Association of Architectural Metal Manufacturers (NAAMM): "Metal Finishes Manual."
3. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): "Architectural Sheet Metal Manual."
4. American Architectural Manufacturer's Association (AAMA): AAMA 2605 "Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels."

1.6 QUALITY ASSUARANCE

A. Basis of Design: When particular manufacturers' materials, products or processes are specified for an item of Work, any one thereof is acceptable for the Contractor to choose. An alternative material, product or process will be considered if the Contractor submits a written substitution request together with such information as may be necessary to assist the Consultant in determining whether the proposed substitution is acceptable, the burden of proof rests solely upon the Contractor.

B. Qualified Installer: The sheet metal flashing and trim work shall be performed by a firm having 5 years' experience in the installation of materials specified on comparable projects.

C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from authorities having jurisdiction.

1.7 GUARANTEE

A. The Contractor shall provide a five (5) year written guarantee, covering the sheet metal flashing and trim materials and workmanship. Should any defects occur during the stated period, they shall be corrected immediately, and all damage caused by such defects shall be corrected. All corrective work shall be at the Contractor's expense. The Guarantee Period shall commence upon final acceptance of the work.

1.8 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.9 WARRANTY

A. The Contractor shall warrant that all Metal Flashing Work executed under this Section will be free from defects in materials and workmanship for a period of ten (10) years from date of acceptance of the Project, and he shall remedy any defects in the Metal Flashing Work.

1.10 PRODUCT HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

C. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

D. Replacements: In the event of damage, immediately make all repairs and replacements necessary at no additional cost to the Owner.

PART 2- PRODUCTS

2.1 MATERIALS

A. General Compatibility: Provide products that are recommended by manufacturer to be fully compatible with indicated substrates and similar proven compounding provisions. Profiles, shapes, and sizes as shown and as required to fulfill performance requirements, and standard with the manufacturer for the purpose intended. Suitable alloy and proper temper for fabricating with adequate structural characteristics, and suitable for finishing as specified.

B. Stainless Steel Flashing Materials
   1. Stainless Steel Flashing: ASTM A167, Type 304, stainless steel, with 2D finish, dead soft temper, fully annealed, as manufactured by International Nickel Co., Republic Steel Corp., United States Steel, or Washington Steel Corp. Thickness of stainless steel shall be as listed below.
      a. Concealed Flashings: .012" thick, thirty (30) gauge (U.S. Standard).
      b. Exposed Flashings: .015" thick, twenty-eight (28) gauge (U.S. Standard).
      c. Edge Strips: .025" thick, twenty-four (24) gauge (U.S. Standard).
   2. Through wall flashing shall have sawtooth ribs at three (3) inch interval as manufactured by Keystone Flashing Co. or an Approved Equal.
   3. Accessories and Fastenings: AISI, Types 302 and 304 stainless steel.
   4. Solder: Composed of sixty (60) percent block tin and forty (40) percent pig lead, except that solder at seams exposed to public view shall be eighty (80) percent tin and twenty (20) percent lead.

5. Flux: An acid type flux manufactured specifically for soldering stainless steel, or an Approved Equal.

C. Copper: ASTM B 370; temper H00 (cold-rolled) except where temper 060 is required for forming; 16 oz. (0.0216-inch thick) except as otherwise indicated.

D. Provide sheet metal cladding at ALL venue spaces, roof area which includes piping, conduits, equipment, and metal ductwork exposed to view. Refer to notes within contract drawings.
1. All exposed insulated ducts shall be clad with premium grad architectural metal enclosure. Seams shall be flush and fully weather sealed. No upstanding flanges are permitted. Cladding surfaces shall be flat without cross brake lines. All equipment on roof shall be shop or manufactured painted with custom color T.B.C.

E. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type non-corrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.2 AUXILIARY MATERIALS

A. Solder for Stainless Steel: ASTM B32; provide 60%- 40% tin/lead solder, with acid-chloride type flux, except use rosin flux over tinned surfaces.

B. Fasteners: Screws, rivets and nails shall be non-corrosive, of same material as sheet metal flashing and trim or compatible material. Match finish of exposed heads with material being fastened.

C. Retainers: 16 gage steel galvanized or stainless.

D. Bituminous Coating: SSPC Paint 12, asphalt mastic, nominally free of sulfur, compounded for 15- mil dry film thickness per coal.

E. Mastic Sealant: Polyisobutylene; non-hardening, non-skinning, non- drying, non- migrating sealant.

F. Elastomeric Sealant: Type recommended by manufacturer of metal and fabricator of components being sealed; comply with ASTM C 920.

G. Polyethylene Sheet: ASTM D 4397, 6 mil thickness. Adhesives: Type recommended by flashing manufacturer for waterproof seaming adhesive application of flashing sheet.

H. Roofing Cement: ASTM D 2822, asphaltic.

I. Elastic Flashing Filler: Closed-cell polyethylene or other soft closed-cell material recommended by elastic flashing manufacturer as filler under flashing loops to ensure movement with minimum stress.

J. Metal Accessories: Provide sheet metal clips, cleats, straps, anchoring devices, and similar accessory units as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gage required for performance.

K. Sealant: As specified in Section 079200 “Joint Sealants”.

L. Foam Tape: ASTM D-1056; closed cell foam, PSA on one side, 1/4 in. or 3/8 in. x 1 in. wide.

M. Epoxy Seam Sealer: 2-part noncorrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior nonmoving joints including riveted joints.

N. Paper Slip Sheet: 5 lb. rosin sized building paper.

O. Polyethylene Underlayment: Minimum 6 mil carbonated polyethylene film resistant to decay when tested in accordance with ASTM E154.

P. Dielectric Separator: Cold applied, asphalt emulsion type complying with ASTM D1187, non-sagging, resistant to severe corrosion conditions; applied in two coats for an overall minimum dry film thickness of 25 mils or heavy coating of epoxy paint in minimum 2.0 mil dry film thickness.

2.3 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

D. FM Approvals Listing: Manufacture and install copings and roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-60, Class 1-75, Class 1-90, Class 1-105, and Class 1-120. Identify materials with name of fabricator and design approved by FM Approvals.

E. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.4 FABRICATION

A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with

details shown and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal flashing and trim work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.

B. Seams: Fabricate nonmoving seams in sheet metal flashing and trim with flat- lock seams. For metal other than aluminum, tin edges to be seamed, form seams, and solder. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.

C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1 in. deep, filled with mastic sealant concealed within joints.

D. Sealant Joints: Where movable, nonexpansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.

E. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with dielectric coating or other permanent separation as recommended by manufacturer/fabricator.

PART 3- EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where sheet metal work is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 METAL FLASHING INSTALLATION

A. General: Comply with manufacturer’s installation instructions and with SMACNA “Architectural Sheet Metal Manual.” Anchor units of work securely in place, providing for thermal expansion of metal units. Conceal fasteners where possible, and set units true to line and level. Install work with laps, joints and seams which will be permanently watertight and weatherproof.

B. Where sheet metal will be in contact with dissimilar materials, provide permanent separation for the sheet metal.

C. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.

D. Fabricate and install metal flashing work in accordance with details and specifications of above Reference Standard, with manufacturer's instructions, and as herein specified, to provide a

watertight installation. Apply metal flashing to smooth, even, sound, clean, dry surfaces free from defects. Make provisions to allow for expansion and contraction of metal flashing work. Wherever practicable, shop form all metal flashing work and deliver ready for installation. Form metal flashing work accurately to required profiles, with flat surfaces, straight edges and corners, free from defects. Fold exposed metal edges back not less than 1/2" and form drip.

E. Nailing: Confine to sheets twelve (12) inches or less in width. Confine nailing to one edge only, locate nails where concealed. Use No. 12 x 1" long flat headed, annular threaded, Type 302 stainless steel nails for nailing to wood blocking; use one (1) inch long masonry nails for nailing to concrete. Space nails four (4) inches o.c. maximum.

F. Cleating: Use cleats where sheets are more than twelve (12) inches in width. Space cleats approximately twelve (12) inches o.c.. Cleats two (2) inches wide by three (3) inches long, of the same material and weight as the metal flashing being installed. Secure one end of the cleat with two (2) nails and fold edge back over the nail heads. Lock other end into seam or into folded edge of metal flashing sheets. Pre-tin cleats for soldered seams.

G. Joining: Join metal flashings with one (1) inch locked and soldered seams except at slip joints. Mallet seams flat and solder full length of seam as specified below.

H. Soldering: Clean and pre-tin edges of metal flashing to be soldered before soldering is begun with solder on both sides for a width of not less than 1-1/2". Solder slowly with well heated metal surfaces. Use ample solder. Show not less than one full inch of evenly flowed solder on seam. Seams shall have a liberal amount of flux brushed in before soldering is commenced. Where soldering paste or killed acid is employed as a flux, soldering shall follow immediately after application of the flux. Upon completion of soldering, clean surfaces of all flux.

I. Slip Joints: Locate slip joints not more than twenty-four (24) feet apart and not more than eight (8) feet from corners. Form slip joints as three (3) inch wide joints with cover piece behind flashing, and fill locked ends neatly with sealant.

J. Cap Flashing: Install over base flashings, in eight (8) to ten (10) foot lengths, lapped six (6) inches at ends. Cap flashing shall be increased longitudinally to produce spring action to hold bottom edge of cap flashing firmly against base flashing. Cap flashing shall lap base flashing at least four (4) inches, with exposed bottom edge at a forty five (45) degree angle downward and folded back on underside at least 1/2" to form drip. Make cap flashing continuous at corners and angles.

K. Miscellaneous Flashing: Provide all other miscellaneous metal flashing not specifically mentioned herein but indicated on drawings and/ or required to provide a watertight installation.

L. Separation of Dissimilar Materials: Back paint surfaces of metal flashing in contact with dissimilar metals or with concrete or masonry with bituminous paint.

M. Reglets
    1. Provide watertight reglets in masonry and concrete work to receive cap flashing. Form reglets of stainless steel using same thickness as stainless-steel sheet metal specified.
    2. In masonry work use open or closed slot reglets with slat at least one (1) inch deep

and 3/16" wide. Provide hook dams or turn-ups for anchoring securely into mortar joints. Insert cap flashing into slot full depth using button punch or lead wedges to lock in place.

3. In concrete work, use open or closed slot reglets with slot sloped upward at forty-five (45) degrees, at least one (1) inch deep and 3/16" wide. For fastening reglets to concrete forms use double-head stainless steel nails spaced twelve (12) inches apart maximum.
4. Insert cap flashing full depth into reglet slot, and wedge in place using lead strips spaced on twelve (12) inch centers maximum or lead caulking rope. When lead strips are used for continuous caulked reglets, use approved weather-resistant fibrous compounds.

N. Through-the-Wall Flashings: Provide through-the-wall flashings as shown. Form bonding features so as not to puddle water on surface. Lap cross joints to interlock design pattern at least three (3) inches. Stop typical flashings in mortar joint 1/2" from exterior face of wall.

3.3 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.

3.4 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

END OF SECTION 076200

SECTION 078100
APPLIED FIREPROOFING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents. The Work of this Section shall include but not be limited to the following:
   1. New fireproofing and patching or existing structural members

1.2 SECTION INCLUDES

A. The Work of this Section includes all labor, materials, equipment, and services necessary to complete the sprayed fire-resistive materials as shown on the drawings and/ or specified herein, including, but not necessarily limited to, the following:
   1. Spray on fireproofing for structural steel.
   2. Seal coat over fireproofing in special areas.
   3. Preparation of surfaces.
   4. Field quality control.

1.3 RELATED SECTIONS

A. Concrete – Section 033000.

B. Structural steel – Section 051200.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer’s product data for fireproofing product indicated for each fire-resistive product specified.

B. Test Reports.
   1. Submit certified test results from an independent testing laboratory indicating compliance of fireproofing products with performance requirements indicated.
   2. Submit test results of in-place performance as required under Part 3 of this section for field quality control.

C. Shop Drawings: Submit structural framing plans indicating the following:
   1. Locations and types of surface preparations required before applying sprayed fire-resistive material.
   2. Extent of sprayed fire-resistive material for each construction and fire-resistance rating, including the following:
      a. Applicable fire-resistive design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
      b. Minimum thicknesses needed to achieve required fire-resistance ratings of structural components and assemblies.

D. Product Certificates: Signed by manufacturer of sprayed fire-resistive material certifying that the products furnished comply with requirements.

E. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

F. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

G. If primer is used on steel or metal deck, submit certifications by supplier of primer that primer is compatible with materials, and will not impair the required performance of the installed fireproofing. Such certification shall be accompanied by evidence that the primer was successfully used in conjunction with the fireproofing material in a UL test applicable to the construction.

H. Product Test Reports: Indicate that physical properties of proposed sprayed fire-resistive materials comply with specified requirements based on comprehensive testing of current product formulations by a qualified testing and inspecting agency according to requirements specified in "Quality Assurance" Article.

I. Research/Evaluation Reports: Evidence of sprayed fire-resistive material's compliance with building code in effect for Project.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain fireproofing materials from a single manufacturer for each different product.

B. Fire Performance Characteristics: Provide materials and construction which are identical to those tested for the following fire performance characteristics, according to test method indicated by UL or other testing and inspecting agency acceptable to authorities having jurisdiction, The Contractor shall be responsible for Fire Performance Testing.
   1. Fire Resistance Ratings: As indicated by reference to design designation in UL “Fire Resistance Directory” for fire-rated assemblies in which fireproofing serves as direct-applied protection, tested per ASTM E 119.
   2. Surface Burning Characteristics: As indicated for each fireproofing product required, tested per ASTM E 84 and listed in UL “Building Materials Directory”

C. Installation
   1. Fireproofing shall be installed in strict accordance with manufacturer’s latest written instructions. Discrepancies between these instructions and this specification, drawings or site conditions are to be resolved by the Architect in writing.
   2. Fireproofing shall be applied by a Contractor approved by the fireproofing manufacturer, and having the proper equipment, in accordance with manufacturer’s recommendations.

3. Before proceeding with the work, the Contractor shall apply fireproofing in accordance with the fire ratings to a representative surface area of approximately 50 square feet. Finish texture shall be inspected by DCAS before proceeding.

D. Installer Qualifications: Engage an experienced installer certified, licensed, or otherwise qualified by sprayed fire-resistive material manufacturer as having the necessary experience, staff, and training to install manufacturer's products according to specified requirements. A manufacturer's willingness to sell its sprayed fire-resistive materials to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.

E. Source Limitations: Obtain each type of sprayed fire-resistive material from one source and by a single manufacturer.

F. Provide products containing no detectable asbestos as determined according to the method specified in 40 CFR, Part 763, Subpart E, Appendix E, Section 1, "Polarized Light Microscopy."

G. Mockups: After processing of initial submittals and before delivery and installation of fireproofing materials, prepare a sample installation of fireproofing work, approximately 100 sq. ft. in area; providing an example of each type required, applied on each different substrate, to produce each different rating as required and reasonably representative of entire sprayed on fireproofing work, for joint approval by representative of fire-resistant material manufacturer and Owner. Work in other areas shall not proceed until mock-up has been completed. Mock-up work which remains in compliance with requirements and is in undamaged and acceptable condition may be retained as final work in place.

H. Material used in New York City must have BSA approval.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in original, unopened packages, Include labels with names of products and manufacturers, date of manufacture, shelf life, and UL labels for fire- resistance ratings.

B. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; shelf life, if applicable; and fire-resistance ratings applicable to Project.

C. Use materials with limited shelf life within period indicated. Remove from Project site and discard materials whose shelf life has expired.

D. Store materials inside, under cover, aboveground, so they are kept dry until ready for use. Remove from Project site and discard materials that have deteriorated.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply sprayed fire-resistive material when ambient or substrate temperatures are 40 deg F. or lower, unless temporary protection and heat is provided to maintain temperatures at or above this level for 24 hours before, during, and for 24 hours

after product application.

B. Ventilation: Ventilate building spaces during and after application of sprayed fire-resistive material to achieve a minimum of four air changes per hour. Use natural means or, where this is inadequate, forced-air circulation until fire-resistive material dries thoroughly.

1.8 SEQUENCING

A. Sequence and coordinate application of sprayed fire-resistive materials with other related work specified in other Sections to comply with the following requirements:
   1. Provide temporary enclosures for interior applications to prevent deterioration of fire-resistive material due to exposure to unfavorable environmental conditions.
   2. Avoid unnecessary exposure of fire-resistive material to abrasion and other damage likely to occur during construction operations after its application.
   3. Do not apply fire-resistive material to metal roof deck substrates until roofing has been completed; prohibit roof traffic during application and drying of fire-resistive material. Fireproofing shall be considered dry when the moisture content is 6% or less.
   4. Do not begin applying fire-resistive material until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.
   5. Defer installing ducts, piping, and other items that would interfere with applying fire-resistive material until application of fire protection is completed.
   6. Do not install enclosing or concealing construction until after fire-resistive material has been applied, inspected, tested, and corrections have been made to defective applications.
   7. Protect permanently exposed walls, floor, or special surfaces.

1.9 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty, executed by Contractor and cosigned by Installer, agreeing to repair or replace sprayed fire-resistive materials that fail within the specified warranty period.
   1. Failures include, but are not limited to, cracking, flaking, eroding in excess of specified requirements; peeling; and delaminating of sprayed fire-resistive materials from substrates due to defective materials and workmanship within the specified warranty period.
   2. Not covered under the warranty are failures due to damage by occupants and Owner's maintenance personnel, exposure to environmental conditions other than those investigated and approved during fire-response testing, and other causes not reasonably foreseeable under conditions of normal use.

C. Warranty Period: Three (3) years from date of Substantial Completion.

PART 2- PRODUCTS

2.1 FIREPROOF PATCHING MATERIALS

A. General: For concealed applications of fireproofing provide manufacturer's standard products complying with requirements indicated below for material composition and physical properties representative of installed products.

B. Cementitious Fireproofing: Factory-mixed dry formulation of inorganic binders and lightweight mineral aggregates mixed with water at project site to form a slurry for troweled-on application.

C. Physical Properties: Minimum values, unless otherwise indicated, measured per standard test methods referenced with each property, as follows.
   1. Bond Strength: 80 lbf per sq. ft. per ASTM E 736.
   2. Compressive Strength: 3.47 lb per sq. inch per ASTM E 761.
   3. Corrosion Resistance: No evidence of corrosion per ASTM E 937.
   4. Deflection: No cracking, spalling, delamination or the like per ASTM E 759.
   5. Effect of Impact on Bonding: No cracking, spalling, delamination or the like per ASTM E 760.
   6. Air Erosion: Maximum weight loss of 0.025 grams per sq. ft. per ASTM E 859.
   7. Dry Density: Values for average and individual densities as required for fire- resistance rating indicated, per ASTM E 605, but not less than 14 lb. per cu. Ft.
   8. Hardness: 0.50-inch maximum penetration per ASTM C 569.
   9. Surface Burning Characteristics: Maximum flame spread, and smoke developed values of 10 and 0, respectively.

D. Products: Subject to compliance with requirements, provide Cemeiltitious Fireproofing as follows; "Monokote"; Grace Construction Products Div., W.R. Grace & Co., Or an Approved Equal.

2.2 AUXILIARY FIREPROOFING MATERIALS

A. General: Provide auxiliary fireproofing materials which are compatible with fireproofing products and substrates approved for use indicated by manufacturer of fireproofing, and which have been approved by UL or other acceptable testing and inspecting agency for use in fire-resistance rated designs indicated.

B. Substrate Primers: Type approved by manufacturer of fireproofing for substrate and for conditions of exposure indicated.

2.3 GENERAL

A. Performance Requirements: Provide applied fireproofing materials and construction which are identical to those tested for the following fire performance characteristics, per test method indicated, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction.

B. Basis of Design: The basis for the design of applied fireproofing shall be that beams and columns are considered restrained unless otherwise noted or specified. In addition, the "structural frame" basis of design approach shall be utilized to establish fire resistance ratings which shall require that all members of the primary structural frame to have the higher fire

resistance rating commonly required for columns. The primary structural frame includes the columns, other structural members including the girders, beams, slabs, terra cotta, trusses, and spandrels having direct connections to the columns, and bracing members designed to carry gravity loads.

C. Fire Resistance Ratings: As indicated by reference to design designation in UL "Fire Resistance Directory" for fire resistance rated assemblies in which applied fireproofing serves as direct applied protection, tested per ASTM E119.

D. Thickness and Density: ASTM E605, thickness and density as required by UL test to attain the fire endurance rating shown or as required by governing authorities for the application shown. Thickness shown is the minimum thickness required solely to determine clearances and, in case of conflict, the fire endurance rating prevails. For structural members of sizes not included in the UL beam and column designs, calculate the required fireproofing thickness in accordance with the equation listed in the UL “Fire Resistance Directory” for adjustment of applied protection material thickness.

E. Surface Burning Characteristics: As indicated for each applied fireproofing product required, tested per ASTM E84 and listed in UL "Building Materials Directory".

F. Content: Provide fireproofing products containing no detectable asbestos as determined according to the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, Polarized Light Microscopy.

2.4 CONCEALED SPRAYED FIRE-RESISTIVE MATERIALS

A. The basis of project design, specifications, contract documentation, GREEN BUILDING compliance criteria and all fire-resistive ratings and assemblies for all concealed cementitious spray-applied fireproofing is predicated on the use of Monokote Type MK-6/HY as manufactured by W.R. Grace & Co.--Conn., Construction Products Division. Or an Approved Equal, substitutions shall be permitted following the requirements and procedures included in this section.
   1. W.R. Grace & Co., 62 Whittemore Avenue, Cambridge, Massachusetts, 02140, 1.617.876.1400, www.na.graceconstruction.com.
   2. If substitutions are proposed, said submittal must be accompanied by a complete listing of all appropriate UL design assemblies. MEA #’s, NYC BSA approval certification and product criteria confirming its equality with the product specified herein.

B. Location: This material shall be utilized in all concealed locations unless specifically identified below:
   1. Perimeter column bay on all floors;
   2. Elevator and mechanical shafts;
   3. Mechanical and elevator equipment rooms;
   4. All areas directly exposed to weather;
   5. Air intake and exhaust plenums;

C. Cementitious Sprayed Fire-Resistive Material:, A factory-mixed, dry, cement aggregate formulation, chloride-free formulation of Portland cement binders, additives, and inorganic

aggregates, mixed with water at Project site to form a slurry or mortar for conveyance and application, complying with the following requirements:

1. Thickness: Provide minimum average thickness indicated below to achieve required fire-resistive design indicated below to be indicated on approved submittals.
   a. Fireproofing shall be of thicknesses and density to meet the requirements of the 2008 New York City Building Code for Type 1B Non-Combustible Construction per BC B602.
   b. Be advised that all beam to column connection shall be considered restrained.
   c. Be advised that all beam to girder connections shall be considered restrained.
   d. Construction Classifications (NYC Building Code 2008 Edition, Table 601):
      1. Columns, girders, trusses and framing: 2.0 hours.
      2. Floor assembly including beams: 2.0 hours
      3. Roof construction including beams, trusses and framing:
         i. Less than 15'-0" AFF : 1 hour
         ii. Between 15' – 20' AFF : 1 hour
         iii. Greater than 20' AFF : 1 hour
2. UL Design Assemblies/Classifications – The Contractor is hereby advised that, as per UL criteria, the thickness of spray-applied material required varies per the size and depth of the framing member involved. What is provided below is only a guide to the assemblies and members that need to be addressed. Consequently, the Contractor shall submit a comprehensive table indicating material to be used, structural elements to be protected with spray-applied fireproofing, hourly rating and material thickness being proposed, appropriate independent laboratory test results for fireproofing selected, the appropriate UL design assembly and approval agency. Members and preliminary thickness:
   a. Primary beam members supporting floor (restrained): UL N706, N779 (MEA# 212-90-M)- 1" thickness – 2.0 hr rating;
   b. Columns (W6 x 9- W14 x 730): UL X772 (MEA #213-90-M) – 1 3/8" thickness: 2 hour;
   c. Tube and Pipe Columns: UL X771, Y710 (MEA #213-90-M) – 1/4" thickness: 1 ½ hour.
   d. Floor assembly including secondary members: UL D925 (MEA #213-90- M)
      1. 4 1/2" normal weight concrete placed over 3" deep 16"-gauge galvanized metal deck (total 71/2") – There is no fireproofing required on the deck, but the beams supporting the deck need to be sprayed in accordance with UL Design D925.
      2. 6" normal weight concrete placed over 3" deep 19"-gauge composite galvanized metal deck (total 9") – None required.
      3. 9" normal weight concrete placed over 3" deep 19"-gauge composite galvanized metal deck (total 12") – None required.
3. Dry Density: The field density shall be measured in accordance with ASTM Standard E605. Minimum average density shall be that required by the manufacturer, or as listed in the UL Fire Resistance Directory for each rating indicated, or as required by the authority having jurisdiction, or a minimum average 240 kg/m3 (15 pcf) whichever is greater.
4. Deflection: Material shall not crack or delaminate from the surface to which it is applied when tested in accordance with ASTM E759.
5. Bond Impact: Material subject to impact tests in accordance with ASTM E760 shall not crack or delaminate from the surface to which it is applied.

6. Bond Strength: Fireproofing, when tested in accordance with ASTM E736, shall have a minimum average bond strength of 9.6 kN/m2 (200 psf) and a minimum individual bond strength of 7.2 kN/m2 (150 psf).
7. Air Erosion: Maximum allowable total weight loss of the fireproofing material shall be 0.00 g/m2 (0.00 g/ft2) when tested in accordance with ASTM E859. Sample surface shall be "as applied" (not pre-purged) and the total reported weight loss shall be the total weight loss over a 24-hour period from the beginning of the test.
8. High Speed Air Erosion: Materials to be used in plenums or ducts shall exhibit no continued erosion after 4 hours at an air speed of 12.7 m/s (47 km/h) [2500 ft/min (29 mph)] when tested per ASTM E859.
9. Compressive Strength: The fireproofing shall not deform more than 10% when subjected to compressive forces of 71 kPa (1,483 psf) when tested in accordance with ASTM E761.
10. Corrosion Resistance: Fireproofing applied to steel shall be tested in accordance with ASTM E937 and shall not promote corrosion of steel.
11. Abrasion Resistance: No more that 15 cm3 shall be abraded or removed from the fireproofing substrate when tested in accordance with the test methods developed by the City of San Francisco, Bureau of Building Inspection.
12. Impact Penetration: The fireproofing material shall not show a loss of more than 6 cm3 when subjected to impact penetration tests in accordance with the test methods developed by the City of San Francisco, Bureau of Building Inspection.
13. Surface Burning Characteristics: Material shall exhibit the following surface burning characteristics when tested in accordance with ASTM E84:
14. Flame Spread 0
15. Smoke Development 0
16. Resistance to Mold: The fireproofing material shall be formulated at the time of manufacturing with a mold inhibitor. Fireproofing material shall be tested in accordance with ASTM G21 and shall show resistance to mold growth for a period of 28 days for general use.
17. Combustibility: Material shall have a maximum total heat release of 20 MJ/m2 and a maximum 125 kw/m22 peak rate of heat release 600 seconds after insertion when tested in accordance with ASTM E1354 at a radiant heat flux of 75 kw/m2 with the use of electric spark ignition. The sample shall be tested in the horizontal orientation.
18. Not permitted for exterior application.

2.5 EXPOSED SPRAYED FIRE-RESISTIVE MATERIALS

A. The basis of project design, specifications, contract documentation, GREEN BUILDING compliance criteria and all fire-resistive ratings and assemblies for all exposed cementitious spray-applied fireproofing is predicated on the use of Monokote Type Z106/HY as manufactured by W.R. Grace & Co.--Conn., Construction Products Division. Or equal substitutions shall be permitted.
   1. W.R. Grace & Co., 62 Whittemore Avenue, Cambridge, Massachusetts, 02140, 1.617.876.1400, www.na.graceconstruction.com. Or an Approved Equal.
   2. If substitutions are proposed, said submittal must be accompanied by a complete listing of all appropriate UL design assemblies. MEA #'s, NYC BSA approval certification and product criteria confirming its equality with the product specified herein.

B. Location: This material shall be utilized in all exposed locations and in high traffic areas subject

to abuse which include but not limited to those locations specifically identified below:

C. Perimeter column bay on all floors;
   1. Elevator and mechanical shafts;
   2. Mechanical and elevator equipment rooms;
   3. Air intake and exhaust plenums.

D. Cementitious Sprayed Fire-Resistive Material: Factory-mixed, dry, cement aggregate formulation, chloride-free formulation of gypsum or Portland cement binders, additives, and inorganic aggregates, mixed with water at Project site to form a slurry or mortar for conveyance and application, complying with the following requirements:
   1. Thickness: Provide minimum average thickness indicated below to achieve required fire-resistive design indicated below to be indicated on approved submittals.
      a. Fireproofing shall be of thicknesses and density to meet the requirements of the 2008 New York City Building Code for Type 1B Non-Combustible Construction per BC B602.
      b. Be advised that all beam to column connection shall be considered restrained.
      c. Be advised that all beam to girder connections shall be considered restrained.
      d. Construction Classifications (NYC Building Code 2008 Edition, Table 601):
         1. Columns, girders, trusses and framing: 2.0 hours.
         2. Floor assembly including beams: 2.0 hours.
         3. Roof construction including beams, trusses, and framing:
            - Less than 15’-0” AFF : 1 hour
            - Between 15’ – 20’ AFF : 1 hour
            - Greater than 20’ AFF : 1 hour

2.6 UL Design Assemblies/Classifications

A. The Contractor is hereby advised that, as per UL criteria, the thickness of spray-applied material required varies per the size and depth of the framing member involved. What is provided below is only a guide to the assemblies and members that need to be addressed. Consequently, the Contractor shall submit a comprehensive table indicating material to be used, structural elements to be protected with spray-applied fireproofing, hourly rating and material thickness being proposed, appropriate independent laboratory test results for fireproofing selected, the appropriate UL design assembly and approval agency. Members and preliminary thickness:
   1. Primary beam members supporting floor (restrained): UL N706, N779 (MEA# 212-90-M) – 1” thickness – 2.0 hr rating;
   2. Columns (W6 x 9 – W14 x 730): UL X772 (MEA #213-90-M) – 1 3/8” thickness: 2 hour.
   3. Tube and Pipe Columns: UL X771, Y710 (MEA #213-90-M) – 1/4” thickness: 1 ½ hour.
   4. Floor assembly including secondary members: UL D925 (MEA #213-90- M)
      a. 4 1/2" normal weight concrete placed over 3" deep 16”-gauge galvanized metal deck (total 71/2") – There is no fireproofing required on the deck, but the beams supporting the deck need to be sprayed in accordance with UL Design D925.
      b. 6" normal weight concrete placed over 3" deep 19”-gauge composite galvanized metal deck (total 9") – None required.
      c. 9" normal weight concrete placed over 3" deep 19”-gauge composite galvanized metal deck (total 12") – None required.

B. Dry Density: The field density shall be measured in accordance with ASTM Standard E605. Minimum average density shall be that required by the manufacturer, or as listed in the UL Fire Resistance Directory for each rating indicated, or as required by the authority having jurisdiction, or a minimum average 350 kg/m3 (22 pcf) whichever is greater.

C. Deflection: Material shall not crack or delaminate from the surface to which it is applied when tested in accordance with ASTM E759.

D. Bond Impact: Material subject to impact tests in accordance with ASTM E760 shall not crack or delaminate from the surface to which it is applied.

E. Bond Strength: Fireproofing, when tested in accordance with ASTM E736, shall have a minimum average bond strength of 94.5 kN/m2 (2,000 psf) and a minimum individual bond strength of 71.8 kN/m2 (1,500 psf).

F. Air Erosion: Maximum allowable total weight loss of the fireproofing material shall be 0.00 g/m2 (0.00 g/ft2) when tested in accordance with ASTM E859. Sample surface shall be “as applied” (not pre-purged) and the total reported weight loss shall be the total weight loss over a 24-hour period from the beginning of the test.

G. High Speed Air Erosion: Materials to be used in plenums or ducts shall exhibit no continued erosion after 4 hours at an air speed of 12.7 m/s (47 km/h) [2500 ft/min (29 mph)] when tested per ASTM E859.

H. Compressive Strength: The fireproofing shall not deform more than 10% when subjected to compressive forces of 966 kPa (20,189 psf) and 719 kPa (15,077 psf) for interior and exterior exposures respectively when tested in accordance with ASTM E761.

I. Corrosion Resistance: Fireproofing applied to steel shall be tested in accordance with ASTM E937 and shall not promote corrosion of steel.

J. Abrasion Resistance: No more that 15 cm3 shall be abraded or removed from the fireproofing substrate when tested in accordance with the test methods developed by the City of San Francisco, Bureau of Building Inspection.

K. Impact Penetration: The fireproofing material shall not show a loss of more than 6 cm3 when subjected to impact penetration tests in accordance with the test methods developed by the City of San Francisco, Bureau of Building Inspection.

L. Surface Burning Characteristics: Material shall exhibit the following surface burning characteristics when tested in accordance with ASTM E84:
   1. Flame Spread- 0
   2. Smoke Development- 0

M. Resistance to Mold: The fireproofing material shall be formulated at the time of manufacturing with a mold inhibitor. Fireproofing material shall be tested in accordance with ASTM G21 and shall show resistance to mold growth for a period of 28 days for general use.

N. Combustibility: Material shall have a maximum total heat release of 20 MJ/m2 and a maximum

125 kW/m2 peak rate of heat release 600 seconds after insertion when tested in accordance with ASTM E1354 at a radiant heat flux of 75 kW/m2 with the use of electric spark ignition. The sample shall be tested in the horizontal orientation.

O. Not permitted for exterior application.

2.7 AUXILIARY FIRE-RESISTIVE MATERIALS

A. General: Provide auxiliary fire-resistive materials that are compatible with sprayed fire-resistive materials and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in
fire-resistive designs indicated.

B. Adhesive for Bonding Fire-Resistive Material: Product approved by manufacturer of sprayed fire-resistive material, used where required by manufacturer to insure proper bond.
1. Monokote® Spatterkote® SK-3 as manufautured by W.R. Grace.
2. A mill-mixed Portland cement based cementitious spray applied fireproofing accessory product. It is designed to be used with Monokote MK-6 on some roof- ceiling designs. Cement based Spatterkote bonds tenaciously to flexible galvanized flat plate steel surfaces used in many of today's most advanced structural steel deck. The thickness of Spatterkote is included in the total final fireproofing thickness.
3. Or an Approved Equal.

C. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required to comply with fire-resistive designs indicated and fire-resistive product manufacturer's written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive sprayed fire-resistive material.

D. Sealer for Sprayed Fire-Resistive Material for use in all Elevator Shafts/Air Intake and Exhaust Plenums: Transparent-drying, water-dispersible protective coating by manufacturer of fire-resistive material.
1. Product: Subject to compliance with requirements, provide "Firebond Concentrate" by W.R. Grace, or similar product recommended by the manufacturer; Or a Approved Equal.
2. As a surface sealer (where specified) shall be installed in one or more coats in such a manner that the sealer does not saturate the fire protection product. The fire protection product shall be substantially dry prior to sealer application.

PART 3- EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, to determine whether they are in satisfactory condition to receive sprayed fire-resistive material. A substrate is in satisfactory condition if it complies with the following:
1. Substrates are free of oil, grease, rolling compounds, incompatible primers, loose mill scale, dirt, or other foreign substances capable of impairing bond of fire- resistive material with substrate under conditions of normal use or fire exposure.
2. Objects penetrating fire-resistive material, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.

3. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying fire-resistive material.

B. Do not proceed with installation of fire-resistive material until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide ventilation in areas to receive fire resistive coating

B. Clean substrates of oil, grease, rolling compounds, incompatible primers, and loose mill scale which could impair bond of fireproofing.

C. Prime substrates where recommended by fireproofing manufacturer.

D. Cover other work and existing improvements which might be damaged by fall-out or spatter of fireproofing materials during application. Provide temporary enclosure as required to confine fireproofing operations, protect the environment, and to ensure adequate ambient conditions for temperature and ventilation.

E. Clean substrates of substances that could impair bond of fire-resistive material, including oil, grease, rolling compounds, incompatible primers, and loose mill scale.

1. Prior to the application, an inspection shall be made to determine that all steel surfaces are acceptable to receive fireproofing. The steel shall be free of oil, grease, rolling compounds or lubricants, loose mill scale, excess rust, noncompatible primer, lock down agent or any other substance that will impair proper adhesion. Where necessary, cleaning or other corrections of surfaces to receive fireproofing shall be the responsibility of the supplier of the incompatible surface.

F. For exposed applications, repair substrates to remove any surface imperfections that could affect uniformity of texture and thickness in finished surface of sprayed fire-resistive material. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

G. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application. Provide temporary enclosure as required to confine spraying operations, protect the environment, and ensure maintenance of adequate ambient conditions for temperature and ventilation.

H. Comply with fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to convey and spray on fire-resistive material, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

I. Install metal lath, as required, to comply with fire-resistance ratings; and fire-resistive material manufacturer's written recommendations for conditions of exposure and intended use. Securely attach lath to substrate in position required for support and reinforcement of fire-resistive material. Use anchorage devices of type recommended in writing by fire-resistive material manufacturer. Attach lathing accessories where indicated or required for secure attachment to

substrate.

J. Coat substrates with adhesive before applying fire-resistive material where required to achieve fire-resistance rating or as recommended in writing by fire-resistive material manufacturer for material and application indicated.

K. Extend fire-resistive material in full thickness over entire area of each substrate to be protected. Unless otherwise recommended in writing by fire-resistive material manufacturer, install body of fire-resistive covering in a single course.

L. Spray apply fire-resistive materials to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by manufacturer.

M. Where sealers are used, apply products that are tinted to differentiate them from the sprayed fire-resistive material over which they are applied.

N. Maintain ambient conditions during installation and for cure period following installation, as recommended by manufacturer. Provide ventilation and avoid excessive rate of drying.
   1. An air and substrate temperature of 40°F (4.4°C) minimum shall be maintained for 24 hours prior to application, during application and for a minimum of 24 hours after application.
   2. Provisions shall be made for ventilation to properly dry the fireproofing after application. In enclosed areas lacking natural ventilation, air circulation and ventilation must be provided to achieve a minimum total fresh air exchange rate of 4 times per hour until the material is substantially dry.

O. Installation Sequence of Fireproofing
   1. All patching and repairing of sprayed fireproofing, due to cutting by other trades or testing and inspection, shall be performed under this Section.
   2. No fireproofing shall be applied prior to completion of concrete work on steel decking.
   3. Application to the underside of roof deck assemblies shall be performed only after roofing application is complete and roof traffic has ceased.

P. Provisions shall be made for ventilation to properly dry the fireproofing after application. In enclosed areas lacking natural ventilation, air circulation and ventilation must be provided.

3.3 INSTALLATION

A. General: Comply with fireproofing manufacturer’s instructions for mixing materials, application procedures and equipment used to convey and troweled fireproofing material.

B. Extend fireproofing full thickness over entire area of each substrate to be protected. Unless otherwise recommended by fireproofing manufacturer, install fireproof patching materials in a single course.

C. Apply fireproofing in thicknesses and densities indicated but not less than that required to achieve fire resistance ratings specified.

D. Apply fireproofing materials by troweled-on method to maximum extent possible.

3.4 FIELD QUALITY CONTROL

A. Testing Laboratory: Contractor shall employ and pay an independent testing laboratory to perform tests required for local authority approval.

B. Repair or replace fireproofing within areas where test results indicate fireproofing does not comply with code or performance requirements.

C. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.
   1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

D. Testing and inspecting of completed applications of sprayed fire-resistive material will take place in successive stages, in areas of extent and using methods as follows. Do not proceed with application of fire-resistive material for the next area until test results for previously completed applications of fire-resistive material show compliance with requirements.
   1. Extent: For each 1000-sq. ft. area, or partial area, on each floor, testing and inspecting agency will evaluate the following characteristics. Tested values must equal or exceed values indicated and values required for approved fire-resistance design.
      a. Thickness for Floors, Roofs, and Walls: From the average of 10 measurements from a 144-sq. in. sample area, with sample width of not less than 6 inches per ASTM E 605.
      b. Thickness for Structural Frame Members: From a sample of 25 percent of structural members per floor, taking 9 measurements at a single cross section for structural frame beams or girders, 7 measurements of a single cross section for joists and trusses, and 12 measurements of a single cross section for columns per ASTM E 605.
      c. Density for Floors, Roofs, Walls, and Structural Frame Members: At frequency and from sample size indicated for determining thickness of each type of construction, per ASTM E 605 or AWCI Technical Manual 12-A, Appendix A, "Alternate Method for Density Determination."
      d. Bond Strength for Floors, Roofs, Walls, and Structural Framing Members: Cohesion and adhesion at frequency and from sample size indicated for determining thickness of each type of construction, per ASTM E 736.
      e. When testing discovers applications of fire-resistive material not in compliance with requirements, testing and inspecting agency will perform additional random testing to determine extent of noncompliance.

E. Remove and replace applications of fire-resistive material where test results indicate that they do not comply with specified requirements for cohesion and adhesion or for density, or both.

F. Apply additional fire-resistive material per manufacturer's written instructions where test results indicate that thickness does not comply with specified requirements.

G. Additional testing and inspecting, at Contractor's expense, will be performed to determine

compliance of replaced or additional work with specified requirements.

3.5 CLEANING, PROTECTING, AND REPAIR

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. The cleaning, repair and protection of the areas affected by the Work of this Section shall be the responsibility of the Contractor to the sole satisfaction of DCAS, at no additional cost to the City.

C. Cure exposed sprayed fire-resistive material according to product manufacturer's written recommendations to prevent premature drying.

D. Protect fire-resistive material, according to advice of product manufacturer and Installer, from damage resulting from construction operations or other causes so fire protection will be without damage or deterioration at the time of Substantial Completion.

E. Coordinate application of fire-resistive material with other construction to minimize the need to cut or remove fire protection. As installation of other construction proceeds, inspect fire-resistive material and patch any damaged or removed areas.

F. Repair or replace work that has not been successfully protected.

3.6 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

END OF SECTION 078100

SECTION 078123
INTUMESCENT FIREPROOFING

PART 1- GENERAL

1.1 SUMMARY

A. Drawings and Contract Documents apply to this Section.

B. Section includes mastic and intumescent fire-resistive coatings, including but not limited to:
   1. Preparing surfaces to receive fireproofing.
   2. Protection of adjacent surfaces from overspraying.
   3. Spray application of water based, intumescent fireproofing on interior, exposed structural steel wide flange columns, beams, pipe columns, and related exposed structural steel to provide rated fireproofing.

1.2 RELATED WORK

A. Division 5 Section – “Structural Steel.”

B. Division 5 Section – “Steel Decking.”

1.3 REFERENCES

A. ASTM D 256- Impact Resistance Test. ASTM D 638- Tensile Strength.

B. ASTM D 695- Standard Test Method for Compressive Strength. ASTM D 790- Standard Test Method for Flexural Strength.

C. ASTM D 1002- Standard Test Method for Bond Strength.

D. ASTM D 1044- Standard Test Method for Abrasion Resistance Test. ASTM D 4541- Bond Strength.

E. ASTM E 84- Test Method for Surface Burning Characteristics of Building Materials.

F. ASTM E 119- Fire Tests of Building Construction and Materials.
U.L., Inc.- Fire Resistance Directory.

G. SSPC-SP-1 Solvent Cleaning- Steel Structures Painting Council (SSPC).

H. SSPC-SP-2 Hand Tool Cleaning- Steel Structures Painting Council (SSPC).

I. SSPC-SP-3 Power Tool Cleaning- Steel Structures Painting Council (SSPC).

J. SSPC-SP-6 Commercial Blast Cleaning- Steel Structures Painting Council (SSPC).

1.4 SUBMITTALS

A. Product Data: For each type of product. Indicate product characteristics, performance, and limitation criteria. Include manufacturer's installation instructions.

B. Shop Drawings: Framing plans or schedules, or both, indicating the following:
   1. Extent of fireproofing for each construction and fire-resistance rating.
   2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
   3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
   4. Treatment of fireproofing after application.

C. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard dimensions or a minimum of 4 inches square in size.

D. Product Certificates:
   1. Manufacturer's certificate that products meet or exceed specified requirements, for each type of fireproofing.
   2. Certification of acceptability of fireproofing materials to authority having jurisdiction.

E. Certified test reports indicating the following:
   1. Fire test reports of fireproofing application to substrate materials similar to project conditions.
   2. U.L. Design Listings from U.L., Inc.

F. Qualification data: Applicator's current certification, by product manufacturer, as a factory trained, and manufacturer approved installer of this product.

1.5 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum five years documented experience.

B. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution.
   1. Build mockup of each type of fireproofing and different substrate and each required finish as shown on Drawings.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 FIELD CONDITIONS

A. Temperature Limitations:
   1. Comply with Manufacturer's temperature requirements.
   2. Do not apply fireproofing when ambient or substrate temperature is 50 deg F. or when surface temperature is less than 5 degrees F above the dew point.
   3. Maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.
   4. When temperature is less than 40F, follow manufacturer's field instructions for cold weather installation.

B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly. Maintain ventilation for 72 hours minimum after application, to dry materials and dissipate solvent odors.

C. Maintain non-toxic, unpolluted working area. Provide temporary enclosure to prevent spray from contaminating air.

1.7 SEQUENCING AND SCHEDULING

A. Sequence work in conjunction with placement of ceiling hanger tabs, mechanical component hangers, and electrical components.

1.8 GUARANTEES

A. Provide two year manufacturer's guarantee under provisions of General Conditions.

B. The Contractor shall provide a written guarantee covering intumescent fireproofing materials and workmanship. Should any defects occur during the stated period, they shall be corrected immediately, and all damage caused by such defects shall be corrected. All corrective work shall be at the Contractor's expense.
   1. Warranty Period: Two years.
   2. The Guarantee Period shall commence upon final acceptance of the work.
   3. Furnish a guarantee in the form specified in Article on Guarantees of the General Conditions governing all contracts.

C. The following types of failure will be judged as defective work: cracking, checking, dusting, flaking, spalling, separation, and blistering.

PART 2- PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions to provide required fire rating.

B. Source Limitations: Obtain fireproofing from single source.

C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

D. Steel members are to be considered unrestrained unless specifically noted otherwise.
E. Asbestos: Provide products containing no detectable asbestos.

2.2 MASTIC AND INTUMESCENT FIRE-RESISTIVE COATINGS

A. Mastic and Intumescent Fire-Resistive Coating <Insert drawing designation or UL-design number>: Manufacturer's standard, factory-mixed formulation or factory-mixed, multicomponent system consisting of intumescent base coat and topcoat, and complying with indicated fire-resistance design.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Albi Manufacturing; a division of StanChem, Inc.
      b. Carboline Company; a subsidiary of RPM International.
      c. Hilti, Inc.
      d. International Protective Coatings.
      e. Isolatek International.
      f. Or an Approved Equal.
   2. Application: Designated for "exterior," "interior general purpose," or "conditioned interior space purpose" use by a qualified testing agency acceptable to authorities having jurisdiction.
   3. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design.
   4. Surface-Burning Characteristics: Comply with ASTM E 84; tested by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
      a. Flame-Spread Index: 25 or less.
      b. Smoke-Developed Index: 50 or less.
   5. Bond strength: ANSI/ASTM E 736
   6. Bond Impact: ASTM E 760, no cracking, flaking, or delamination
   7. Dry density: ASTM E 605
   8. Finish: As selected by Architect from manufacturer's standard finishes.

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

C. Reinforcing Fabric as required: Glass- or carbon-fiber fabric of type, weight, and form required

to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.

D. Reinforcing Mesh as required: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachment.

E. Topcoat: Suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.

PART 3- EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design.
   1. Verify that substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
   2. Verify that objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
   3. Verify that substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.
   4. Verify that voids and cracks in substrate are filled, and projections are removed where fireproofing is exposed to view as a finish material.

B. Conduct tests according to fireproofing manufacturer's written instructions to verify that substrates are free of substances capable of interfering with bond.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Start of work constitutes acceptance of existing substrate.

3.2 PREPARATION.

A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application. Protect floor areas from this Work by completely covering with tarps or 4 mil polyethylene sheets.

B. Close off and seal ductwork in areas where fireproofing is being applied.

C. Clean substrates of dirt, dust, grease, oil, loose material, or other substances that could impair bond of fireproofing.

D. Prepare substrate to SSPC-SP-1, SSPC-SP-2, SSPC-SP-3, or SSPC-SP-6 standards as required by the manufacturer.

E. Prime substrates where included in fire-resistance design and where recommended in writing by

fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.

F. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, topcoats, finishing, and other materials and procedures affecting fireproofing work.

B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.
   1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
   2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.

D. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written instructions for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.

E. Spray apply fireproofing to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.

F. Extend fireproofing in full thickness over entire area of each substrate to be protected.

G. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.

H. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.

I. Cure fireproofing according to fireproofing manufacturer's written instructions.

J. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.

K. Finishes: Where indicated, apply fireproofing to produce the following finishes:
   1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.

2. Spray-Textured Finish: Finish left as spray applied with no further treatment.
3. Rolled, Spray-Textured Finish: Even finish produced by rolling spray-applied finish with a damp paint roller to remove drippings and excessive roughness.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
   1. Test and inspect as required by the IBC, Subsection 1705.14, "Mastic and Intumescent Fire-Resistant Coatings."

B. Fireproofing will be considered defective if it does not pass tests and inspections.
   1. Remove and replace fireproofing that does not pass tests and inspections, and retest, at no cost to the Owner.
   2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest, at no cost to the Owner.

3.5 CLEANING, PROTECTING, AND REPAIRING

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing is without damage or deterioration at time of Substantial Completion.

C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.

D. Repair fireproofing damaged by other work before concealing it with other construction.

E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

3.6 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

END OF SECTION 078123

SECTION 078413
PENETRATION FIRESTOPPING

PART 1- GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the firestops and smoke seals as shown on the drawings and/ or specified herein, including, but not limited to, the following:
   1. Through Penetration Firestopping for the passage of cable, cable tray, conduit, pipe, duct, electrical bus-way, or other raceways through fire rated floor/ceiling (vertical barriers) and/ or/wall/partitions (horizontal barriers)..
   2. Recessed Light fixtures and openings in fire rated ceilings, floor/ceiling systems.
   3. Building Perimeter Firestopping between edge of floor slabs and curtain walls.
   4. Gaps between the head of wall and ceiling, or roof assemblies.
   5. Expansion joints in fire rated walls and floors.
   6. Openings around structural support members, which penetrate floors/walls.
   7. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
   8. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.
   9. Sealant joints in fire-resistance-rated construction.
   10. Penetrations at each floor level in shafts and/ or stairwells.
   11. Construction joints, including those between top of fire rated walls and underside of floors above.

B. Perform all work required and furnish all materials necessary to complete proper installation of firestops in fire rated walls, floors and partitions, around penetrations of pipe, conduit, duct, cable, cable tray, bus duct, and all other devices, or in blank openings, as required by the job Contract Documents.

1.3 RELATED SECTIONS

A. Related work which requires the placement of material, other than closure devices such as doors, for closing openings in fire rated barriers may be covered under other sections of the specifications. Only tested firestop systems shall be used in the locations and specification sections listed in Divisions 03, 04, 05, 07, 08 and 09.

B. A single contractor to maintain consistency and accountability on the project shall perform firestopping work.

C. Cast-in-place concrete- Section 033000.

D. Unit masonry- Section 042000.

E. Joint sealers- Section 079200.

F. Drywall- Section 092900.

1.4 REFERENCES

A. ASTM E 84 “Surface Burning Characteristics of Building Materials.”

B. ASTM E 119 “Standard Method of Fire Tests of Building Construction and Materials."

C. ASTM E 814 "Standard Method of Fire Tests of Through-Penetration Firestops."

D. ASTM E 1399 “Standard Test Methods for Cyclic Movement and Measuring of Joint Systems.”

E. ASTM E 1966 “Standard Test Methods for the Fire Testing of Joint Systems.”

F. ASTM E 2174 “Standard Practice for On-Site Inspection of Installed Firestops.”

G. UL263 “Fire Test of Building Construction Materials.”

H. UL723 “Surface Burning Characteristics Test of Building Materials”

I. UL1479: Fire Test of Through-Penetration Firestops

J. UL 2079 "Tests for Fire Resistance of Building Joint Systems."

K. ANSI/UL 263- Fire Tests of Building Construction and Materials.

L. ANSI/UL 1479- Standard for Fire Tests of Through-Penetration Firestops

M. UL® Fire Resistance Directory- Current Year Edition- Section Classifications
   1. (CLIV) Wall Opening Protective Materials
   2. (XHEZ) Through-Penetration Firestop Systems
   3. (XHHW) Fill, void or Cavity Materials
   4. (XHJI) Firestop Devices
   5. (XHKU) Forming Materials
   6. (XHLU) Pipe Covering Materials

N. Other Test Agencies and Jurisdictional Authorities which publish design performance or design evaluation services shall be acceptable, e.g
   1. Factory Mutual Approval Guide- Current Year Edition (FM)
   2. FM4991: FM Approval Standard of Firestop Contractors – Class4991
   3. Omega Point Laboratories – Listing Services (OPL)

4. Inchcape Testing Services (Warnock Hersey,) (WH)
5. Southwest Research (SwRl)
6. Underwriters Laboratories of Canada (U LC)
7. Underwriters Laboratories Products Certified for Canada (CU L)
8. Jurisdictional Authorities – ICC- BOCA- CABO- ICBO- SBCCI, Individual States, Cities, and Municipalities

1.5 DEFINITIONS

A. FIRESTOPS: Specially tested materials used to reestablish the integrity of a fire rated wall, floor, or other partition after the structure has been breached for the through- penetration of building utility items.

B. THROUGH PENETRATION: Pipes, conduits, ducts, cable trays, cable, wire, or any other element passing completely through an opening in a fire rated barrier/assembly.

C. MEMBRANE PENETRATION: Any penetration of a fire rated barrier that breaches one side but does not pass completely through to the other side.

D. SYSTEM: The combination of specific materials and/ or devices, including the penetrating item(s) required to complete the firestop, as tested by an independent third party test facility.

E. BARRIER/ASSEMBLY: A wall, floor, or other partition with a fire rating of 1, 2, 3 or 4 hours.

F. F-RATING: The time a firestop-penetrating item/building material/firestop material- can withstand direct flame without a burn through as tested to ASTM E814 / UL 1479 / UL 2079.

G. T-RATING: The amount of time a through-penetration firestop limits the temperature rise on the cold side- outside the test furnace- as tested to ASTM E814 / UL 1479 / UL 2079.

H. L-RATING: The L-Rating criteria determines the amount of air leakage, in cubic feet per minute, per square foot of opening (CFM/sq ft), through the firestop system at ambient and/ or 400 F air temperature at an air pressure differential of 0.30 in. W.C. L-Ratings are used to determine the suitability of a firestop to stop smoke and toxic gases in accordance with the National Fire Protection Association Life Safety Code, NFPA 101.

1.6 SYSTEM DESCRIPTION

A. Design Requirements.
1. Designs selected for installation shall provide a fire resistance rating that is at least equal to the hourly resistance rating of the floor, wall or partition into which the firestop design will be installed.
2. Firestop systems and materials shall not require special tools for installation, and shall not emit hazardous, combustible, or irritating fumes during installation, curing, or use.
3. When more than one firestop design is acceptable, individual product characteristics shall be evaluated for secondary performance benefits, e.g. environmental sealing

of water and dust, or for ease of retrofit modifications.

B. General Considerations:
   1. Firestop systems do not re-establish the structural integrity of load bearing barriers. Consult structural engineer prior to cutting or core drilling any load bearing assembly.
   2. Firestop systems are not designed for or intended to support live loads and traffic. Curbs or steel plates may be required to restrict or accommodate potential traffic. Contractor shall notify DCAS if there is reason to believe these limitations may be violated.

1.7 SUBMITTALS

A. Submit manufacturer's technical data/product literature, for each type of firestop material to be installed. Literature shall provide at minimum, product description, characteristics, test data, typical usage examples, independent test agency information, a product specification, installation temperature and storage requirements.

B. Submit shop drawings detailing materials, installation methods, and relationships to adjoining construction for each firestop system, and each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of qualified testing and inspection agency evidencing compliance with requirements for each condition indicated.
   1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop configuration for construction and penetrating items.

C. Submit complete listing of all materials and systems to be used include UL® or FM ® Classification information or other third-party test documentation.

D. Material Safety Data Sheets: Submit MSDS for each firestop product.

E. Submit qualifications of firestop installer, including letter from firestop manufacturer of products proposed to be installed, wherein manufacturer approves or recognizes as trained/ or certifies installer for installation of that manufacturer's products.

F. Manufacturer's Letters: For installations or configurations not covered by a UL or Warnock Hersey design number, a engineering judgement shall be obtained from the manufacturer, in writing, for the specific application to be approved by authorities having jurisdiction. Submit manufacturers "engineering determination" drawings for non- standard installations where no 3rd party tested system exist.

G. Submit certificate, or other documentation, from manufacturer stating that the installer has been trained in the proper installation of said manufacturer’s product and is recognized as qualified to install such manufacturer’s product. In lieu of this documentation, installer shall submit a list of past projects to demonstrate capability to satisfactorily perform intended installations.

H. Submit product from "One Manufacturer" for entire project. Said manufacturer must be

the entity producer of the products sold. Said manufacturer must have been producing firestop products for a minimum of 10 years.

1.8 QUALITY ASSURANCE

A. General: Provide firestopping systems that are produced and installed to resist the spread of fire, and the passage of smoke and other gases.

B. Firestopping materials shall conform to Flame (F) and Temperature (T) ratings as required by local building code and as tested by nationally accepted test agencies per ASTM E 814 or UL 1479. The F rating must be a minimum of one (1) hour but not less than the fire resistance rating of the assembly being penetrated. T rating, when required by code authority, shall be based on measurement of the temperature rise on the penetrating item(s). The fire test shall be conducted with a minimum positive pressure differential of 0.01 inches of water column.

C. Installation shall conform to requirements of qualified system designs, or manufacturer approved modification, as supported by engineering reports, or as approved by DCAS and accepted by the authority having jurisdiction. All manufacturers engineering determinations or modifications shall be made, and signed by one of the manufacturers, in house, staff Firestop engineers.

D. Exposed surfaces of the firestop shall be finished to the standard of adjacent faces of the barrier being penetrated.

E. Firestopping products shall be asbestos free and free of any PCBs.

F. Do not use any product containing solvents or that requires hazardous waste disposal.

G. Do not use firestop products which after curing, dissolve in water.

H. Do not use firestop products that contain ceramic fibers.

I. Regulatory Requirements
   1. Firestop systems shall be installed in all openings and around all penetrating items as required by these Contract Documents, and as required by applicable design, building and construction codes, subject to the interpretation of the jurisdictional authorities.
   2. Firestop materials shall have the approval of the authority having jurisdiction.

J. Certification:
   1. The performance of the intended firestop designs shall have been demonstrated by third party testing in accordance with the applicable reference standards of Paragraph 1 .2A and 1 .2B.
   2. Evidence of third-party acceptance shall include labeling or listing by an acceptable agency, as found in said agencies directory, or via written report.
   3. Manufactured assemblies and material formulations shall be prepared under third party monitored Quality Control Program, e.g., UL® Follow-up Service.
   4. Manufacturer shall be ISO 9001 compliant.

5. Contractor shall certify compliance with this section.

K. Firestopping Installer Qualifications: Firestop and fire resistive joint systems application shall be performed by a single firestopping contractor who specializes in the installation of firestop and fire resistive joint systems, whose personnel to be utilized have received specific training and certification or approval from the proposed respective firestop manufacturer, and firestop installer shall have a minimum of three years' experience (under present company name) installing firestop systems of the type herein specified.

L. Mock-Up: Prepare job site mock-ups of each typical Firestop System proposed for use in the project. Approved mock-ups will be left in place as part of the finished project and will constitute the quality standard for the remaining work.

M. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
2. For floor penetrations with annular spaces exceeding 4 inches or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means.
3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

1.9 PERFORMANCE REQUIREMENTS

A. Provide systems that are listed by at least one the following:

B. Provide firestop products that are flexible enough to allow for pipe vibration in a through penetration application.

C. Provide fire resistive sealants and sprays for construction joint applications that are flexible enough to satisfy the movement criteria per the test standards ASTM E 1399, ASTM E 1966, or ANSI/UL 2079.

D. Provide products with the appropriate flame spread index and smoke develop index, when tested in accordance with ASTM E 84.

E. Provide products that bear classification marking of qualified independent testing agency.

F. Provide products identical to those tested and listed for classification by UL, Intertek, or any other qualified independent testing agency.

G. Provide products that are compatible with each other, with the substrates forming openings, and with the items, if any, penetrating the firestopping, under the conditions represented by this project, based on testing and field performance demonstrated by manufacturer.

H. Firestopping materials must meet and be acceptable for use by all building codes and NFPA codes cited in this section.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original unopened containers with manufacturer's name, product identification, lot numbers, UL, or Warnock Hersey labels, and mixing and installation instructions, as applicable.

B. Store materials in the original, unopened containers or packages, and under conditions recommended by manufacturer.

C. All firestop materials shall be installed prior to expiration of shelf life.

D. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at jobsite.

1.11 PROJECT CONDITIONS

A. Site conditions shall be in accordance with manufacturer’s requirements. Temperatures and other environmental conditions should not fall outside manufacturer’s suggested limits.

B. Verify existing conditions and substrates before starting work.

C. Do not use materials that contain solvents, show sign of damage or are beyond their shelf life.

D. During installation, provide masking and drop cloths as needed to prevent firestopping products from contaminating any adjacent surfaces.

E. Conform to ventilation requirements if required by manufacturer's installation instructions or Material Safety Data Sheet.

F. Weather Conditions: Do not proceed with installation of firestop products when temperatures are in excess or below the manufacturer's recommendations. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install firestopping under environmental conditions outside manufacturer's absolute limits.

G. Schedule installation of firestop products after completion of penetrating item installation but prior to covering or concealing of openings.

H. Coordinate this work as required with work of other trades.

I. Coordinate construction and cutting of openings so that each particular firestop system may be installed in accordance with its listing, including assembly rating, L rating, sizing, sleeves, manufacturer’s published STC rating and penetrating items.

J. Coordinate firestopping of dynamic and static construction joints (top-of-wall, bottom-of-wall, floor-to-floor, floor-to-wall), wall-to-wall, perimeter so that each particular system may be installed in accordance with its listing, including assembly rating, sizing,

movement capabilities and manufacturer's published STC rating.

1.12 WARRANTY

A. At project closeout, provide to Owner or Owners Representative an executed copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

1.13 SEQUENCING AND SCHEDULING

A. Pre-Installation Conference: Convene a pre-installation conference to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

B. Sequence: Perform work of this and other sections in proper sequence to prevent damage to the firestop systems and to ensure that their installation will occur prior to enclosing or concealing work.

C. Install all firestop systems after voids and joints are prepared sufficiently to accept the applicable firestop system.

D. Do not cover firestop systems until they have been properly inspected and accepted by the authority having jurisdiction.

PART 2- PRODUCTS

2.1 FIRESTOPPING

A. Manufacturer
   1. EGS Nelson Firestop Products, Tulsa, OK. (800) 331-7325
   2. Or an Approved Equal

B. Materials
   1. Only firestop products that have been third party tested in accordance with ASTM E- 814/UL1479; ASTM E-1966/UL2079- for specific fire rated construction penetrations or construction joints shall be considered and used. Items shall be tested to specific parameters including the type and number of penetrating items, the size of the penetrating items, the maximum allowable annular space, joint width (& expansion/contraction), and rated for the hourly requirement of the structure.

C. FIRESTOPPING #1
   1. Acceptance products for sealing nominal openings with penetrations of non-combustible items to include cast and steel pipe, copper pipe, conduit, and electrical metallic tubing (EMT).
      a. Nelson ES-1399 Firestop Elastomeric Sealant; Or an Approved Equal.
      b. Nelson CLK Firestop Silicone Sealant; Or an Approved Equal.
      c. Nelson LBS3 Firestop Intumescent Latex Based Sealant; Or an Approved Equal.
      d. Nelson FSP Firestop Putty; Or an Approved Equal.

D. FIRESTOPPING #2
   1. Acceptable products for sealing openings with penetrations of combustible items (penetrants which are consumed by high heat and fire) including plastic pipe-PVC/CPVC etc., insulated metallic pipe, electric all data/telecommunications cable, cable bundles, in closed pipe systems).
      a. Nelson ES-1399 Firestop Elastomeric Sealant, Or an Approved Equal.
      b. Nelson FSP Firestop Putty, Or an Approved Equal.
      c. Nelson FSC3 Firestop Coating (3rd generation), Or an Approved Equal.
      d. Nelson LBS3 Firestop Latex Based Sealant, Or an Approved Equal.
      e. Nelson PCS Firestop Pipe Choke Systems/Devices, Or an Approved Equal.
      f. Nelson PLW Firestop Pillows, Or an Approved Equal.
      g. Nelson WRS3 Firestop Intumescent Wrap Strips & Restraining Collars, Or an Approved Equal.

E. FIRESTOPPING #3
   1. Acceptable products for penetrations of combustible pipes in open pipe systems.
      a. Nelson LBS3 Firestop Latex Based Sealant; Or an Approved Equal.
      b. Nelson PCS Firestop Intumescent Pipe Choke System Collar/Devices; Or an Approved Equal.
      c. Nelson WRS3 Firestop Intumescent Wrap Strips & Restraining Collars; Or an Approved Equal.
      d. Nelson FSP Firestop Putty; Or an Approved Equal.

F. FIRESTOPPING #4
   1. Acceptable products for large size – complex penetrations which accommodate individual or combinations of cable trays, multiple steel or copper pipes, electrical conduits, busways, or electrical / data / telecommunications cables.
      a. Nelson FB Intumescent Fire Brick, Or an Approved Equal.
      b. Nelson PLW Intumescent Firestop Pillows, Or an Approved Equal.
      c. Nelson CPS Firestop Intumescent Composite Sheet, Or an Approved Equal.
      d. Nelson CMP Firestop Mortar Compound, Or an Approved Equal.
      e. Nelson FSP Firestop Putty, Or an Approved Equal.

2.2 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide products of one of the following manufacturers:
   1. Tremco
   2. Bio-Fireshield
   3. 3M
   4. Specified Technologies Inc.
   5. U.S. Gypsum Co.
   6. Nelson
   7. Hilti, Inc.
   8. Grace Flame Safe;
   9. Or an Approved Equal.

2.3 FIRESTOPPING, GENERAL

A. Compatibility: Provide firestopping composed of components that are compatible with

each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.

B. Provide non-hardening resilient firestop material at penetrations, sleeves, and passthroughs in acoustic construction assemblies. Acceptable products: Specified Technologies Inc. Elastomeric Sealant ES100; Johns Manville Firetemp CI Caulk; 3M Fire Barrier 2001 Silicone RTV Foam; Or an Approved Equal.

C. Accessories: Provide components for each firestopping system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:
   1. Permanent forming/damming/backing materials including the following:
      a. Semirefractory fiber (mineral wool) insulation.
      b. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
      c. Fire-rated form board.
      d. Joint fillers for joint sealants.
   2. Temporary forming materials.
   3. Substrate primers.
   4. Collars.
   5. Steel sleeves.

D. Applications: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

E. Smokeseals at top of partitions shall be flexible to allow for partition deflection.

2.4 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

A. Endothermic, Latex Compound Sealant: Single-component, endothermic, latex formulation.

B. Intumescent, Latex Sealant: Single-component, Intumescent, latex formulation.

C. Intumescent Putty: Non-hardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.

D. Intumescent Wrap Strips: Single-component, elastomeric sheet with aluminum or polyethylene foil on one side.

E. Job-Mixed Vinyl Compound: Prepackaged vinyl-based powder product for mixing with water at Project site to produce a paintable compound, passing ASTM E 136, with flame-spread and smoke-developed ratings of zero per ASTM E 84.

F. Mortar: Prepackaged dry mix composed of a blend of inorganic binders, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.

G. Pillows/Bags: Re-usable, heat-expanding pillows/bags composed of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.

H. Silicone Foam: Two-component, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, non-shrinking foam.

I. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:
   1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and non-sag formulation for openings in vertical and other surfaces requiring a non-slumping/gunnable sealant unless firestop system limits use to non-sag grade for both opening conditions.

2.5 FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated that complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to fire-resistive joint sealants.
   1. Sealant Colors: Color of exposed joint sealants as selected by the Architect.

B. Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.
   1. Additional Movement Capability: Provide sealant with the capability to withstand 33 percent movement in both extension and compression for a total of 66 percent movement.

C. Multi-Component, Non-Sag, Urethane Sealant: Type M; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, A, and (as applicable to joint substrates indicated) O.
   1. Additional Movement Capability: Provide sealant with the capability to withstand 40 percent movement in extension and 25 percent in compression for a total of 65 percent movement in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated.

D. Single-Component, Non-Sag, Urethane Sealant: Type S; Grade NS; Class 25; and Uses NT, M, A, and (as applicable to joint substrates indicated) O.

E. 3M FireDam Spray 200: Water-based, paintable, low VOC, freeze/thaw resistant spray applied fire resistive product. Applied with conventional airless spray equipment.
   1. Fire Resistance: For use in 1-, 2-, 3- or 4-hour fire rated systems.
   2. Compression/Extension Recovery: +/- 50 percent of joint width.
   3. Location: For use at head-of-wall, wall-to-wall, floor-to-floor, bottom-of-wall, floor- to-wall and perimeter joints.
   4. STC-Rating of 56 when tested in STC 56-rated wall assembly.

2.6 MINERAL FIBER/CERAMIC WOOL NON-COMBUSTIBLE INSULATION (FIRE SAFING)

A. Provide min. 4 pcf Thermafiber as manufactured by Thermafiber Co., min. 4 pcf FBX Safing Insulation as manufactured by Fibrex, or approved equal to suit conditions and to comply with fire resistance and firestop manufacturer's requirements; Or An Approved Equal.

B. Material shall be classified non-combustible per ASTM E 119.

2.7 MIXING

A. For those products requiring mixing prior to application, comply with firestopping manufacturer's directions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce firestopping products of uniform quality with optimum performance characteristics for application indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions with Installer present, for compliance with requirements for opening configuration, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:
   1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.
   2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form release agents from concrete.

B. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing seal of firestopping with substrates.

3.3 CONDITIONS REQUIRING FIRESTOPPING

A. Interior Walls and Partitions
   1. Construction joints between top of fire rated walls and underside of floors above, shall be firestopped.
   2. Firestop system installed shall have been tested by either UL or Omega Point, including exposure to hose stream test and including for use with steel fluted deck floor assemblies.
   3. Firestop system used shall allow for deflection of floor above.

B. Penetrations
   1. Penetrations include conduit, cable, wire, pipe, duct, or other elements which pass through one or both outer surfaces of a fire rated floor, wall, or partition.

   2. Except for floors on grade, where a penetration occurs through a structural floor or roof and a space would otherwise remain open between the surfaces of the penetration and the edge of the adjoining structural floor or roof, provide firestopping to fill such spaces in accordance with ASTM E 814.
   3. These requirements for penetrations shall apply whether sleeves have been provided, and whether or not penetrations are to be equipped with escutcheons or other trim. If penetrations are sleeved, firestop annular space, if any, between sleeve and wall of opening.

C. Provide firestopping to fill miscellaneous voids and openings in fire rated construction in a manner essentially the same as specified herein before.

3.4 INSTALLING THROUGH PENETRATION FIRESTOPS

A. General: Comply with the through penetrations firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for through penetration firestop systems by proven techniques to produce the following results:
   1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
   2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
   3. For fill materials that will remain exposed after completing work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

D. Identification: Identify penetration firestopping systems with preprinted metal labels mechanically fastened. Attach labels permanently to surfaces adjacent to and within 6” of edge of firestopping system so they are visible to anyone seeking to remove penetrating

items or firestopping systems.

1. Information Labels: “Warning” – Penetration Firestopping System – Do Not Disturb. Notify Building Management of Any Damage.
2. Contractor’s name/address and phone number.
3. Penetration firestopping system designation.
4. Date of installation.
5. Penetration firestopping system Manufacturer’s name.
6. Installer’s name.

3.5 INSTALLING FIRE RESISTIVE JOINT SEALANTS

A. General: Comply with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire resistance rating required.

C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.

D. Tool no sag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.6 INSTALLING FIRESAFING INSULATION

A. Install fire safing insulation utilizing welded or screw applied galvanized steel impaling pins and retaining clips; space clips or pins 24" o.c. maximum.

B. Completely fill voids in areas where safing insulation is required. At spandrel conditions/floor edges, depth of insulation top to bottom shall be at least four (4) inches.

C. Cover top of all safing insulation with firestop sealant or spray.

3.7 FIELD QUALITY CONTROL

A. Inspecting agency employed and paid by the Owner will examine completed firestopping, fire resistive joint systems and perimeter fire barriers to determine, in general, if it is being installed in compliance with the submitted designs for the required ratings by the contract documents and are acceptable to the authorities having jurisdiction.

B. Inspecting agency will report observations promptly and in writing to Contractor, Owner, and Architect.

C. Do not proceed to enclose firestopping with other construction until reports of examinations are issued.

D. Where deficiencies are found, Contractor must repair or replace firestopping so that it complies with requirements.

3.1 CLEANING

A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.

B. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to product firestopping complying with specified requirements.

3.2 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID HEET

END OF SECTION 078413

SECTION 079200
JOINT SEALANTS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. The Work of this Section includes all labor, materials, equipment and services necessary to complete the joint sealers work as shown on the drawings and/ or specified herein, including but not necessarily limited to the following:
1. Silicone joint sealants
2. Urethane joint sealants
3. Polysulfide joint sealants
4. Latex joint sealants
5. Solvent-release-curing joint sealants
6. Performed joint sealants
7. Acoustical joint sealants
8. Flashing reglets and retainers.
9. Exterior wall joints not specified to be sealed in other Sections of work.
10. Interior wall joints not specified to be sealed in other Sections of work, including caulking to fill between architectural woodwork and any wall, floor and/ or ceiling imperfections.
11. Control and expansion joints in walls.
12. Joints at wall penetrations.
13. Joints between items of equipment and other construction.
14. All other joints required to be sealed to provide a positive barrier against penetration of air and moisture.

1.3 RELATED SECTIONS

A. Division 03 Sections

B. Division 04 Section “Unit Masonry” for masonry control and expansion joint fillers and gaskets

C. Division 08 Section “Hollow Metal Doors and Frames” for sealant for door frames

D. Firestop sealants – Section 078413.

E. Glazing sealants- Section 088000.

F. Sealant within drywall construction- Section 092900.

G. Sealant at tile work- Section 093000.

H. Division 09 Section “Acoustical Panel Ceilings”

I. General Performance: Joint sealers are required to establish and maintain airtight and waterproof continuous seals.

1.4 REFERENCES

A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.

B. American Society for Testing and Materials (ASTM):
1. ASTM C1193 "Standard Guide for Use of Joint Sealants”.
2. ASTM C1401 “Standard Guide for Structural Sealant Glazing”.
3. ASTM C1330 “Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants”.
4. ASTM C1087 “Test Method for Determining Compatibility of Liquid-
5. Applied Sealants with Accessories Used in Structural Glazing Systems”.
6. ASTM C1247 “Standard Test Method for Durability of Sealants Exposed to Continuous Immersions in Liquids.”

1.5 SYSTEM DESCRIPTION

A. Design Requirements
1. Exterior Joint Sealants: Provide exterior elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
2. Interior Joint Sealants: Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.
3. Compatibility: Provide only the sealants and joint fillers which are explicitly recommended by the manufacturer for the application, and which have been determined by tests to be totally compatible with the joint surfaces and each other, as stated in the manufacturer’s published data or certified by the manufacturer for each application.
4. Staining: Provide sealant systems which shall not cause or contribute to staining of substrate surfaces. Manufacturer shall perform staining tests of sealant systems in accordance with ASTM C1248 for each joint substrate condition in the Work.
5. Suitability for Immersion in Liquids. Where sealants are indicated for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

1.6 PERFORMANCE CRITERIA

A. Quality Control Submittals: Submit the following for Consultant’s information:

1. Test Reports
   a. Preconstruction Compatibility and Adhesion Testing: Submit results of preconstruction compatibility and adhesion testing as specified herein, indicating which joint sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing including which substrates require priming and recommended primer type(s).
   b. Preconstruction Stain Resistance Testing: Submit results of preconstruction stain resistance testing as specified herein, indicating which joint sealants and substrates combinations resulted in staining or other detrimental conditions. Along with test results, submit sealant manufacturer's letter stating agreement to provide warranty against staining based on ASTM C1248.
   c. Preconstruction Field Testing: Submit results and evaluations of preconstruction field testing as specified herein.
2. Certificates
   a. Document Review: Before commencing work, submit a written statement signed by the Subcontractor and the Applicator certifying that the Contract Documents, shop drawings and product data have been reviewed with material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.
   b. Certification (in the form of standard data sheet or letter) that each type of compound and sealant to be furnished complies with these Specifications.
   c. Certification that each type of sealant joint filler and sealant backer rod has been tested for compatibility with selected sealant in accordance with ASTM C1087 and is recommended by the sealant manufacturer for the intended use.

B. Closeout Submittals: Submit for Owner's documentation.
   1. Warranties: Special warranties as specified.
   2. Reinstallation Instructions: Submit a set of reinstallation instructions for each sealant type provided in a form suitable for the buildings' maintenance staff to be able to repair and replace failed sealants within the scope of building maintenance.

1.7 QUALITY ASSURANCE

A. Basis of Design: When particular manufacturers' materials, products or processes are specified for an item of Work, any one thereof is acceptable for the Subcontractor to choose. An alternative material, product or process will be considered if the Subcontractor submits a written substitution request together with such information as may be necessary to assist the Consultant in determining whether the proposed substitution is acceptable, the burden of proof rests solely upon the Subcontractor.

B. Qualification of Installers: Use only personnel who are thoroughly familiar, skilled, and specially trained in the techniques of sealant work, and who are completely familiar with the published recommendations of the sealant manufacturer.

C. Mock-Ups: Provide joint sealants, fillers, gaskets, related accessories, and miscellaneous materials for visual mock-ups, as specified under other Sections, representing the materials and installation techniques which will be used in the final Work.

D. Field Samples: Prior to the Pre-Installation Meeting, provide a field sample for each type of joint sealer system in the building at areas to be designated by the Consultant.

E. Samples shall represent the primary types of materials, substrate surfaces, joint size, exposure, and other conditions to be encountered in the Work. Utilize the same materials and installation methods in the sample as required for the final Work.

F. Schedule the installation with allowance for sufficient curing time so that the sample may be examined, and any necessary adjustments made, at least 1 week prior to date scheduled for commencing installation of the Work. When accepted, sample areas shall serve as the standard for materials, workmanship, and appearance for such Work throughout the project.
   1. Examination of Field Samples: As part of the Pre-Installation Meeting, visually examine the samples for staining, dirt pickup, shrinkage, color, general workmanship, and appearance. Cut and pull the sealant from each sample joint, and examine for internal bubbles or voids, adhesion, and general compatibility with substrate.
   2. Field work shall conform to the parameters set in the mockup and at the pre-installation meeting with regards to acceptable joint design, surface preparation, appearance, color, backer rod selection, adhesion, and compatibility.

G. Testing
   1. Preconstruction Compatibility and Adhesion Testing: Prior to testing of mock-ups, submit samples of materials that will contact or affect joint sealants to sealant manufacturers for compatibility and adhesion testing, as indicated below:
      a. Perform sealant adhesion evaluation at the earliest possible time after award of the Contract.
      b. The sealant manufacturer shall perform adhesion evaluation tests in accordance with ASTM C794 using the sealant and production run samples of the finished substrates which are to be used in the test mock-up and in the final Work.
      c. Use test methods standard with manufacturer to determine if priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates. Perform tests under laboratory conditions of 72 deg. F. temperature and 50% relative humidity. Manufacturer(s) of sealant(s) shall submit written recommendations when installations involve adverse temperature or humidity conditions.
      d. Furnish to the sealant manufacturer the finished substrate samples of such size and quantity as he requires for compatibility and adhesion evaluation. The substrate metal samples shall be of the alloy and with the temper, surface treatment and preparation, primer and finish in each specified color, as are to be used in the test mock-ups and in the final Work.
      e. Schedule sufficient time for testing and analysis of results to prevent delay in the progress of the Work.
      f. Investigate materials failing compatibility or adhesion tests and obtain sealant manufacturer's written recommendations for corrective measures, including use of specially formulated primers.
      g. Testing will not be required when sealant manufacturer is able to submit joint preparation data required above which is acceptable to consultant and is based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those

submitted.

2. Preconstruction Stain Resistance Testing: Prior to testing of mock-ups, submit fully identified samples of materials that will contact or affect joint sealants to sealant manufacturers, in sizes and quantities as required, for stain testing, as indicated below:
   a. Manufacturer shall perform tests of sealant systems for exterior applications in accordance with ASTM C1248 method for each joint substrate condition in the Work Submit quantities of each type of contiguous joint substrate material as required by referenced standard and in sizes as required by the sealant manufacturer for testing.
   b. Schedule sufficient time for testing and analysis of results to prevent delay in the progress of the Work.
3. Preconstruction Field Testing: Prior to installation of joint sealants, field test their adhesion to joint substrates as follows:
   a. Locate test joints where indicated or, if not indicated, as directed by Consultant.
   b. Conduct field tests for each type of exterior elastomeric sealant and joint substrate application.
   c. Arrange for tests to take place with the Subcontractor, the Construction Manager, the Consultant, and the sealant manufacturer's technical representative present.

   d. Test Method: Test joint sealants according to “Method A, Field-Applied Sealant Joint Hand Pull Tab”, in Appendix X1 in ASTM C1193 and ASTM C1521 "Standard Practice for Evaluating Adhesion of Installed Weatherproofing Joints". For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
   e. Report whether sealant in joint connected to pulled out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.
   f. Evaluation of Field Test Results: Joint sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use joint sealants which fail to meet manufacturer’s guidelines for adhesion to joint substrates during testing.

H. Pre-Installation Meeting: Prior to the installation of sealant, meet at the Project site to review the material selections, joint preparations, installation procedures and coordination with other trades. Examine sample installations which have been prepared and determine (and record) whether everyone present agrees that the proposed installations are likely to perform as required.

1.8 SUBMITTALS

A. Shop Drawings: Submit shop drawings showing all joint conditions, indicating relation of adjacent materials, all sealant materials (sealant, bond breakers, backing, primers, etc.), and method of installation.
   1. Submit joint sizing calculations certifying that movement capability of sealant is not being exceeded.

B. Samples: Submit the following:
   1. Color samples of sealants.
   2. Sealant bond breaker and joint backing.

C. Product Data: Submit manufacturer's technical information and installation instructions for:
   1. Product Data: Submit manufacturer’s technical data and installation instructions for each joint sealer product required.
   2. Certified Tests: Submit certified test reports tor elastomeric sealants on aged performances, including hardness, stain resistance, adhesion, cohesion, low-temperature flexibility, modulus of elasticity, and resistance to heat and weathering.
   3. Certificates: Submit certificates from manufacturers that their products comply with specifications and are suitable for the use indicated.

1.9 ENVIRONMENTAL CONDITIONS

A. Temperature: Install all work of this Section when air temperature is above forty (40) degrees F. and below eighty (80) degrees F., unless manufacturer submits written instructions permitting sealant use outside of this temperature range.

B. Moisture: Do not apply work of this Section on surfaces which are wet, damp, or have frost.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original unopened containers with labels indicating manufacturer,

expiration date, and other pertinent data.

B. Protection: Use all means necessary to protect the materials of this Section, before, during and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

D. Storage
   1. Store sealant materials and equipment under conditions recommended by their manufacturer.
   2. Do not use materials stored for a period exceeding the maximum recommended shelf life of the material.

1.11 WARRANTIES

A. General: Warranties and guaranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties and guaranties made by the Subcontractor under requirements of the Contract Documents.
   1. Special Warranty: Submit a written warranty agreeing to repair or replace silicone

sealant compounds which have failed to provide airtight and watertight joints for any reason, or which appear to have failed in adhesion, cohesion, abrasion-resistance, migration-resistance, stain-resistance, general durability or any other form of apparent deterioration (excluding inherent qualities and limitations clearly specified in the manufacturer's data which was submitted). Period of warranty shall be ten (10) years, and warranty shall be signed by the Manufacturer, the installer, and the Subcontractor. Comply with these Specifications for repair or replacement of work.

2. Special Warranty: Submit a written warranty agreeing to repair or replace sealant compounds which have stained contiguous materials (excluding inherent qualities and limitations clearly specified in the manufacturer's data which was submitted). Period of warranty shall be twenty (20) years, and warranty shall be signed by the Installer, Manufacturer, and Subcontractor. Comply with these Specifications for repair or replacement of work.

1.12 GUARANTEE

A. The Contractor shall provide a five (5) year written guarantee, covering the Joint Sealants materials and workmanship. Should any defects occur during the stated period, they shall be corrected immediately, and all damage caused by such defects shall be corrected. All corrective work shall be at the Contractor’s expense. The Guarantee Period shall commence upon final acceptance of the work.

B. The following types of failure will be adjudged as defective work:
   1. Abnormal deterioration, aging, or weathering
   2. Failure in adhesion or cohesion or to remain watertight.

C. Guarantee shall further state that installed sealant is guaranteed against:
   a. Adhesive or cohesive failure of sealant joints.
   b. Crazing greater than three (3) mils in depth developing on surface of material.
   c. Staining of surfaces adjacent to joints by sealants or primer by migration through building materials in contact with them.
   d. Chalking, or visible color change on surface of cured sealant.
   e. Increase or decrease of "Shore A" durometer hardness (5 second reading) of sealant of more than thirty (30) percent of seven (7) day value of "Shore A" durometer hardness of sealant.

D. Include in guaranteed provision, agreement to repair and/ or replace, at Contractor's expense, sealant defects which develop during guarantee period, because of faulty labor and/ or materials.

PART 2- PRODUCTS

2.1 MANUFACTURERS (APPROVED EQUALS WILL ALSO BE ACCEPTED):

A. Manufacturers of Polyurethane Sealants
   1. “Chem-Calk 950”; Bostik Construction Products Div
   2. “Vulkem 45”; Mameco International, Inc
   3. “NR-201 Urexpan”; Pecora Corp
   4. “Sonolastic SL-I”; Sonneborn Building Products Div, Rexnord Chemical Products

Inc.
5. Or an Approved Equal

B. Manufacturers of Nonacid Silicone Sealants
1. “Chem-Calk N-Cure 2000”; Bostik Construction Products Div
2. “Dow Coming 790”; Dow Coming Corp.
3. “Silglaze N SCS 2501“; General Electric Co.
4. “Silpruf SCS 2000”; General Electric Co.
5. Or an Approved Equal

C. Manufacturers of Acid-Curing Silicone Sealants
1. “Chem-Calk 1200”; Bostik Construction Products Div.
2. “Dow Coming 999A”; Dow Coming Corp.
3. “SCS 1000”; General Electric Co.
4. “Construction 1200”; General Electric Co.
5. Or an Approved Equal.

D. Manufacturers of Sanitary Sealants
1. “Dow Coming 786”; Dow Coming Corp.
2. “SCS 1702 Sanitary”; General Electric Co.
3. “863 #345 White”; Pecora Corp.
4. Or an Approved Equal.

E. Manufacturers of Acrylic Sealants
1. “60+Unicrylic”; Pecora Corp.
2. “PTI 738”; Protective Treatments Inc
3. “PTI 767”; Protective Treatments Inc.
4. “Mono”; Tremco Inc.
5. Or an Approved Equal

F. Manufacturers of Butyl-Polyisobutylene Sealants
1. “PTI 404”; Protective Treatments Inc.
2. “Extru-Seal Tape”; Pecora Corp.
3. “Shim-Seal Tape”; Pecora Corp.
4. “PTI 606 or 303 or 626”; Protective Treatments, Inc.
5. “Tremco 440 Tape”; Tremco Inc.
6. Or an Approved Equal

G. Manufacturers of Security Sealants
1. “La-Mod Gel” Sika Corp.
2. Or an Approved Equal

2.2 SEALANT MATERIALS

A. General: Provide joint sealants, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience. Use non-sag compounds for other areas except as shown or specified.

B. Polyurethane Sealant: (For joints in floors and pavements) One-part, polyurethane- based

sealant; complying with ASTM C920 Type S Class 25, self-leveling type.

C. Silicone Rubber Sealant: One-part silicone-rubber-based, non-sag sealant; complying with ASTM C920 Type S Class 25 Grade NS.
   1. Non-Acid Type (For exterior Joints): Provide non-acid, “low modulus” type; with tensile strength minimum 245 psi at 100% elongation per ASTM 0412.
   2. Sanitary Interior Type: Where used in high-humidity or wet service, provide manufacturer’s mold/mildew-resistant, acid type sealant for application to nonporous sealant bond surfaces.

D. Acrylic Sealant: (For interior non-moving joints) Acrylic terpolymer, solvent-based, one-part, thermo-plastic sealant compound; solid not less than 95% acrylic; recommended by manufacturer for general use as an exposed building construction sealant.

E. Polyisobutylene Sealant: (For concealed joints subject to shear movement but not subject to normal joint movement) Provide either liquid or preformed ribbon (coiled with release paper) of polyisobutylene-based mastic as recommended by manufacturer.

F. Security Sealant (Sealant within inmate areas): Two component, solvent free, epoxy resin formulated for non-sag, gap-filling material used as a small joint filler.

G. Use non-hardening, permanently resilient, non-shrinking and non-cracking sealant to seal acoustically critical constructions airtight.

H. Use compressible closed-cell foam backer rod as required.

I. To seal gaps 3/8 inch in dimension, and larger, pack with glass/mineral fiber batt prior to installing sealant materials.

J. Elastomeric Compounds
   1. Sealant Type SE01: Silicone Rubber ASTM C920, Type S, Grade NS, neutral cure, Class and Use as best suited for the intended purpose; Provide one of the following:
      a. "795 Building Sealant" or 790 Silicone Building Sealant (Dow Corning Corp.).
      b. "SilPruf SCS2000” (General Electric Co. Momentive Performance Materials Inc.).
      c. Or an Approved Equal
   2. Sealant Type SE02: Silicone Rubber Complies with ASTM C920 Type S, Grade NS, neutral cure, and ASTM C1184 requirements, is compatible with system components with which it comes in contact, and is specifically formulated and tested for use as a structural sealant; Class and Use as best suited for the intended purpose; Provide one of the following:
      a. "995 Structural Glazing Sealant" (Dow Corning Corp.) for field use and "983 Silicone Glazing and Curtainwall adhesive/sealant"(Dow Corning Corp.) for use in the shop.
      b. "Ultraglaze 4000 Silicone Structural Glazing Sealant" (Momentive Performance Materials Inc.); and "Ultraglaze SSG4400 Silicone Structural Glazing Sealant" (Momentive Performance Materials Inc.) for use in the shop.

c. Or an Approved Equal

3. Sealant Type SE03: Multi-Component or One-Part Low Modulus, Pourable, Self-Leveling Polyurethane Capable of 50% +/- movement; ASTM C920, Type M or S, Grade NS, class and use as best suited for the intended purpose; Provide one of the following:
   a. “Elasto-Thane 230 LM Type II” (Pacific Polymers International, Inc.).
   b. "Sikaflex-15 LM" (Sika Chemical Co.).
   c. "Dynatrol I-XL" (Pecora Corp.).
   d. Or an Approved Equal
4. Sealant Type SE04: Silicone Rubber Concrete and Precast Concrete Sealant Low modulus, non-sag, one component silicone sealant; ASTM C920, Type S, Grade NS), Class 100/50 and Use T, A, M, and O. Provide one the following:
   a. "NS Parking Structure Sealant" (Dow Corning Corp.)
   b. “Bondaflex Sil 728 NS” (May National Associates, Inc.).
   c. “Spectrem 800” (Tremco Incorporated).
   d. Or an Approved Equal

K. Non-Elastomeric Mildew Resistant Compounds
1. Sealant Type SE05: Silicone Sanitary Rubber ASTM C920, Type S, Grade NS; Provide white color unless otherwise shown or specified. Provide one of the following:
   a. "Silicone Sanitary SCS 1700 Sealant" (Momentive Performance Materials Inc.).
   b. "786 Mildew Resistant Silicone Sealant" (Dow Corning Corp.).
   c. "898 Sanitary Silicone Sealant" (Pecora Corp.).
   d. "Tremsil 200 Sanitary" (Tremco).
   e. Or an Approved Equal

L. Non-Elastomeric Compounds
1. Sealant Type SE06: Butyl Rubber ASTM C1311 Non-sag, suitable for ±5 percent joint movement.
   a. " BC-158" (Pecora Corp.)
   b. " PTI 707" (Protective Treatments Inc.)
   c. "Tremco Butyl Sealants" (Tremco, Inc.)
   d. Or an Approved Equal
2. Sealant Type SE07: Acrylic Latex ASTM C834 Non-sag emulsion sealant, suitable for ±7.5 percent joint movement; Provide one of the following:
   a. "AC-20" (Pecora Corp.).
   b. "Tremflex 834" (Tremco).
   c. "Sonolac" (BASF Building Systems).
   d. “Bondaflex 600” (May National Associates, Inc.).
   e. Or an Approved Equal

M. Non-Skinning Mastic Compounds
1. Sealant Type SE08: Mastic Compound A non-drying, non-skinning, non- hardening compound for sealing small, concealed joints; one of the following:
   a. "PTI 200" (Protective Treatments, Inc.).
   b. Or an Approved Equal
2. Sealant Type SE09: Polyisobutylene Mastic Compound A non-drying, non-skinning, non-oxidizing, non-bleeding heavy mastic sealing compound of

polyisobutylene for sealing large, concealed joints; one of the following:
a. "PTI 707" (Protective Treatments, Inc.).
b. "Pecora BC158" (Pecora Corp.).
c. "Curtainwall Sealant" (Tremco).
d. Or an Approved Equal

B. Tape Sealants
1. Sealant Type SE10: Butyl Mastic Tape Polyisobutylene-butyl or butyl reinforced tape. Self-adhesive, non-drying, non-hardening.
a. "Extru-Seal Tapes" (Pecora Corp)
b. "PTI 606" (Protective Treatments Inc.)
c. "Tremco 440 Tape" (Tremco Inc.)
d. Or an Approved Equal

C. Color of Sealant: For concealed joints provide manufacturer's standard color which has the best overall performance qualities for the application shown. For exposed joints the Consultant will select colors from the manufacturer's standard colors unless special colors are shown or specified.

2.3 JOINT FILLER MATERIALS

A. Filler Type JF01: Compressible Rod, ASTM C1330; Provide non-gassing rod fillers, types as shown, or as required for proper performance of the sealant in the specific joint, which is compatible with sealant, as recommended by sealant manufacturer. One of the following:
1. Closed Cell Polyethylene or Polyolefin Foam Rod: One of the following:
a. "Sof-Rod" (Nomaco, Inc).
b. "Green-Rod Polyethylene Backer Rod" (Nomaco, Inc.)
c. "HBR Backer Rod" (Hercules, Inc.).
d. Or an Approved Equal
2. Backer Rod for Silicone Joint sealants: One of the following:
a. "Denver Foam" as distributed by Pecora Chemical Corp. or Woodmont Products Inc.
b. "Sof-Rod" (Nomaco, Inc).
c. Or an Approved Equal

D. Filler Type JF04: Compressible Filler, Continuous closed cell neoprene complying with ASTM D1056; with pressure sensitive temporary positioning adhesive on one side; thickness and width as shown.

E. Filler Type JF05: Filler for Concrete Paving, ASTM D1751, asphalt saturated cellulosic fiber.

2.4 JOINT FILLERS AND SEALANT BACKERS

A. Sponge Rubber: (For joints in floors and pavements) Provide resilient, non-extruding, open-cell type pre-molded rubber, gray to match concrete, complying with ASTM D 1752 Type I.

B. Closed-Cell Synthetic Rubber: (For exterior joints requiring maximum durability) Provide expanded synthetic rubber complying with ASTM D1I752 or ASTM D 1056, Class SC-E (oil-resistant and medium swell), of density as recommended by the manufacturer.

C. Expanded Polyethylene: (For typical joints, except concrete joints) Provide flexible, compressible, non-gassing closed-cell polyethylene, subject to approval of the sealant manufacturer.

D. Open-Cell Polyurethane: (For joints of low percentage movement) Provide flexible, compressible, open-cell polyurethane foam subject to approval of the sealant manufacturer.

2.5 AUXILIARY MATERIALS

A. Joint Cleaner: Provide nonstaining, chemical cleaners of type which are recommended by and acceptable to manufacturers of joint sealants and sealant backing materials, which are not harmful to substrates and adjacent nonporous materials, and which do not leave oily residues or otherwise have a detrimental effect on sealant adhesion or in- service performance.

B. Joint Primer and Sealer: Provide non-staining compounds recommended by the manufacturer of the sealant for the specific joint surface and condition.

C. Bond Breaker Tape: Polyethylene tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

D. Masking Tape: Provide nonstaining, nonabsorbent type compatible with joint sealants and to surfaces adjacent to joints.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where joint sealers are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 PREPARATION

A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer.

B. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with the following requirements:
   1. Remove foreign material from joint substrates which could interfere with adhesion

of joint sealer, including dust; paints, (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility), old joint sealers, oil, grease, waterproofing, water repellants, water; surface dirt, and frost.

2. Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil free compressed air.
3. Remove laitance and form release agents from concrete.
4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile; and other nonporous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.

C. Joint Priming: Prime or seal substrates, except where written reports of tests conducted by an independent testing agency have been submitted which demonstrate that primer or sealer is not required for the conditions of use and the substrates involved. Apply primer to comply with recommended application requirements. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.

D. Previously Treated Joints: Do not apply elastomeric compounds to joint surfaces previously treated with paint, lacquer, sealer, curing compound, water repellent or other coatings unless a laboratory test for durability of bond has been successfully completed in accordance with ASTM C794.

E. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing sealant.

3.3 INSTALLATION

A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications and conditions required by this Project where more stringent installation requirements are specified herein, such requirements shall apply.

B. Supervision: The Contractor shall submit to the Architect written certification from the sealant manufacturer that the applicators have been instructed in the proper application of their materials. The Contractor shall use only skilled and experienced workmen for installation of sealant.

C. Apply sealant under pressure with a hand or power actuated gun or other appropriate means. Gun shall have nozzle of proper size and provide sufficient pressure to completely fill joints as detailed. Neatly point or tool joint to provide the contour as indicated on the drawings.

D. Preparation and Application
   1. Thoroughly clean all joints, removing all foreign matter such as dust, oil, grease,

water, surface dirt and frost. Sealant must be applied to the base surface. Previously applied film must be entirely removed.

2. Stone, masonry, and concrete surfaces to receive sealant shall be cleaned where necessary by grinding, water blast cleaning, mechanical abrading, or combination of these methods as required to provide a clean, sound base surface for sealant adhesion.
    a. Do not use any acid or other material which might stain surfaces.
    b. Remove laitance by grinding or mechanical abrading.
    c. Remove loose particles present or resulting from grinding, abrading, or blast cleaning by blowing out joints with compressed air, oil, and water free, or vacuuming joints prior to application of primer or sealant.
3. Clean non-porous surfaces such as metal and glass chemically. Remove protective coatings on metallic surfaces by solvent that leaves no residue and is compatible with sealant. Use solvent and wipe dry with clean, dry lint free paper towels. Do not allow solvent to air dry without wiping. Clean joint areas protected with masking tape or strippable films as above after removal of tape film.
4. Do not seal joints until they are in compliance with drawings or meet with the control section standard.
5. Joint Size and Sealant Size: Joints to receive sealant shall be at least 1/4" wide. In joint 1/4" to 3/8" wide, sealant shall be 1/4" deep. In joints wider than 3/8" and up to 1" wide, sealant depth shall be one half the joint width. For joints wider than 1", sealant depth shall be as recommended by the sealant manufacturer. Depth of joint is defined as distance from outside face of joint to closest point of the filler.
6. Primer: Thoroughly clean joints and apply primer to all surfaces that will receive sealant. Apply primer on clean, dry surfaces, and prior to installation of joint backing. Completely wet both inner faces of the joint with primer. Mask adjacent surfaces of joint with non-staining masking tape prior to priming.
7. Joint Backing: In joints where depth of joint exceeds required depth of sealant, install joint backing (after primer is dry) in joints to provide backing and proper joint shape for sealant. Proper shape for sealant is a very slight "hourglass" shape, with back and front face having slight concave curvature. Use special blunt T- shaped tool or roller to install joint backing to the proper and uniform depth required for the sealant. Joint backing shall be installed with approximately twenty-five (25) percent compressions. Do not stretch, twist, braid, puncture, or tear joint backing. Butt joint backing at intersections.
8. Bond Breaker: Install bond breaker smoothly over joint backing so that sealant adheres only to the sides of the joint and not backing.
9. Sealant Application: Apply sealant in accordance with the manufacturer's application manual and manufacturer's instructions, using handguns or pressure equipment, on clean, dry, properly prepared substrates, completely filling joints to eliminate air pockets and voids. Mask adjacent surfaces of joint with
10. non-staining masking tape. Force sealant into joint in front of the tip of the "caulking gun" (not pulled after it) and force sealant against sides to make uniform contact with sides of joint and to prevent entrapped air or pulling of sealant off of sides. Fill sealant space solid with sealant.
11. Tooling: Tool exposed joints to form smooth and uniform beds, with slightly concave surface conforming to joint configuration per Figure 5A in ASTM C 1193. Finished joints shall be straight, uniform, smooth and neatly finished. Remove masking tape immediately after tooling of sealant and before sealant face starts to "skin" over. Neatly remove any excess sealant from adjacent surfaces of joint,

leaving the work in a neat, clean condition.

12. Replace sealant which is damaged during construction process.

E. Sample Section of Sealant
   1. During sealant installation work in exterior wall, the manufacturer of sealant shall send his representative to the site, under whose supervision a section of the wall (used as "control section") shall be completed for purposes of determining performance characteristics of sealant in joints. Architect shall be informed of time and place of such installation of control section.
   2. Control section shall be installed according to specification given herein and shall not be considered as acceptable until written acceptance is provided by the Architect.
   3. Accepted control section shall be standard to which all other sealant work must conform.

F. Install elastomeric sealants to depths as recommended by sealant manufacturer but within the following general limitations, measured at center (thin) section of bead.
   1. For joints subject to traffic, abrasion and indentation, fill joints to a depth equal to 75% of joint width, but neither more than 5/8” deep nor less than 3/8” deep.
   2. For normal moving joints not subject to traffic, fill joints to a depth equal to 50% of joint width, but neither more than 1/2” deep nor less than 1/4” deep.
   3. For joints sealed with non-elastomeric sealants fill joints to a depth in range of 75% to 125% of joint width.

G. Do not allow sealants onto adjoining work. Clean adjoining surfaces to eliminate evidence of sealants.

H. Recess exposed edges of exposed joint fillers slightly behind adjoining surfaces, so that compressed units will not protrude.

I. Install security sealant in open joints between all building components attached to walls and floors in inmate areas.

J. Installation of Preformed Impregnated Foams: Install each length of foam immediately after removing protective wrapping, taking care not to pull or stretch material, utilizing installation methods, materials, and tools which produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of foam requires acceleration to produce seal, apply heat as recommended.

K. Installation of Preformed Hollow Neoprene Gaskets: Install gaskets, with minimum number of end joints, in joint recesses with edges free of spalls and sides straight and parallel, both within tolerances. Apply recommended adhesive to joint substrates immediately prior to installing gaskets. For straight sections provide gaskets in continuous lengths; where changes in direction occur, adhesively splice gasket together to provide watertight joint. Recess gasket below adjoining joint surfaces by 1/8 in. to 1/4 in.

L. Horizontal Joints, General: Joints Not Subject to Traffic or Other Abrasion: Apply sealant to a depth equal to 50% of the joint width, but not less than 1/4 in. [6mm] and not more than 1/2 in. Against rough surfaces or in joints of uneven widths avoid the appearance of

excess sealant by locating the sealant well back into joint wherever possible. Tool exposed surfaces slightly concave, except provide a slight wash on horizontal joints where horizontal and vertical surfaces meet.

M. Sidewalk, Pavement, and Similar Horizontal Joints: Apply sealant to a depth equal to 75% of the joint width, but not less than 3/8 in. and not more than 3/4 in. Pour self-leveling sealant in horizontal joints to a level 1/16 in. below the adjoining surfaces, unless otherwise shown or recommended by the manufacturer.

3.4 FIELD QUALITY CONTROL

A. Subcontractor's Quality Control Responsibilities: Subcontractor is solely responsible for quality control of the Work.

B. Field-Adhesion Testing: During exterior joint sealant installation, field test sealant adhesion to joint substrates as follows:
   1. Extent of Testing: Test completed exterior elastomeric sealant joints as follows:
      a. Perform 10 tests for the first 1000 ft. of joint length for each type of exterior elastomeric sealant and joint substrate.
      b. Perform 1 test for each 1000 ft. of joint length thereafter or 1 test per each floor per elevation.
   2. Test Method: Test joint sealants according to "Method A, Field-Applied Sealant Joint Hand Pull Tab" in Appendix X1 in ASTM C1193 and ASTM C1521. For joints with dissimilar substrates, verify adhesion to each substrate separately; do this by extending cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
   3. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field-adhesion-test log.
   4. Inspect tested joints and report on the following:
      a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes field-adhesion hand-pull test criteria.
      b. Whether sealants filled joint cavities and are free of voids.
      c. Whether sealant dimensions and configurations comply with specified requirements.
   5. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
   6. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
   7. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

C. Waterproof Test: After curing exterior compounds, test joints for leaks by applying a stream of water perpendicularly from a 3/4 in. dia. hose equipped with a control valve,

pressure gage, and 1/2 in inside dia. brass nozzle. Adjust the water flow to 30 psi at the nozzle inlet and spray the water perpendicular to the joint at a distance 12 in. from the surface. Slowly move the nozzle back and forth for 5 minutes along a 5 ft. segment of joint. Starting from the lowest point and working upward, repeat the process on successive segments until every designated location has been tested. Test the sealed joint system of not less than 25% of the construction components. Test the sealed joint system comprised of the actual construction components. Conduct tests in the presence of the Construction Manager and the Consultant's representative who will determine the actual percentage of joints to be tested and the period of waterflow exposure, based upon any evidence of leakage. Repair leaks or other defects and retest as directed. Repair or replace other work damaged by such leaks.

3.5 ADJUSTING

A. Cleaning: Clean off excess joint sealants or sealants smears adjacent to joints as work progresses by methods and with approved cleaning materials.

3.6 PROTECTION

A. Protection: Protect joint sealants and related accessories during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.

B. Coatings: Do not apply paint or other coatings near joint surfaces until after sealants have been installed and are nominally cured, so that adhesion will not be impaired by migration of such substances onto the joint surfaces.

3.7 MEASUREMENT AND PAYMENT

A. Unit Price – SEE BID SHEET

B. Sealant work includes joint surface preparation, cleaners, primer /sealers, sealant backer rods, joint fillers and bond breaker tapes as specified and/ or recommended by the sealant manufacturer.

END OF SECTION 079200

SECTION 081113
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Contract Documents apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Standard hollow metal doors and frames.
   2. Custom hollow metal doors and frames.

B. Related Sections:
   1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
   2. Division 08 Section "Stainless-Steel Doors and Frames" for hollow metal doors and frames manufactured from stainless steel.
   3. Division 08 Section "Detention Doors and Frames" for hollow metal doors and frames for detention facilities.
   4. Division 08 Section "Sound Control Door Assemblies" for packaged, acoustical hollow metal door and frame assemblies with STC ratings of 35 or more.
   5. Division 08 Section "Door Hardware (Scheduled by Describing Products)" for door hardware for hollow metal doors.
   6. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

C. Custom Hollow Metal Work: Hollow metal work fabricated according to ANSI/NAAMM-HMMA 861.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating**,** and finishes.

B. Shop Drawings: Include the following:
   1. Elevations of each door design.
   2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
   3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   4. Locations of reinforcement and preparations for hardware.
   5. Details of each different wall opening condition.
   6. Details of anchorages, joints, field splices, and connections.
   7. Details of accessories.
   8. Details of moldings, removable stops, and glazing.
   9. Details of conduit and preparations for power, signal, and control systems.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification:

1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.
2. For the following items, prepared on Samples about 12 by 12 inches to demonstrate compliance with requirements for quality of materials and construction:
   a) Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
   b) Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow metal panels and glazing if applicable.

E. Other Action Submittals:
1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

1.5 INFORMATIONAL SUBMITTALS

A. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252, UBC Standard 7-2 or UL 10B and UL 10C.
1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

C. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9 and UBC Standard 7-4. Label each individual glazed lite.

D. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784 and UBC Standard 7-2.

E. Preinstallation Conference: Conduct conference at the DCAS selected work site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
1. Provide additional protection to prevent damage to finish of factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch-high wood blocking. Do not store in a manner that traps excess humidity.
   1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.9 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Amweld Building Products, LLC.
   2. Benchmark; a division of Therma-Tru Corporation.
   3. Ceco Door Products; an Assa Abloy Group company.
   4. Curries Company; an Assa Abloy Group company.
   5. Deansteel Manufacturing Company, Inc.
   6. Firedoor Corporation.
   7. Fleming Door Products Ltd.; an Assa Abloy Group company.
   8. Habersham Metal Products Company.
   9. Karpen Steel Custom Doors & Frames.
   10. Kewanee Corporation (The).
   11. Mesker Door Inc.
   12. Pioneer Industries, Inc.
   13. Security Metal Products Corp.
   14. Steelcraft; an Ingersoll-Rand company.
   15. Windsor Republic Doors.
   16. Or Approved Equal.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A40, G60 or A60 metallic coating.

D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.
   1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.

G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

I. Glazing: Comply with requirements in Division 08 Section "Glazing."

J. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD HOLLOW METAL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
   1. Design: Flush panel or As indicated.
   2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.
      a) Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
      b) Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 6.0 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
         1) Locations: Exterior doors and interior doors where indicated.
   3. Vertical Edges for Single-Acting Doors: Beveled edge, Square edge or Manufacturer's standard.
      a) Beveled Edge: 1/8 inch in 2 inches.
   4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.
   5. Top and Bottom Edges: Closed with flush or inverted 0.042-inch-thick, end closures or channels of same material as face sheets.
   6. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
   1. Level 1 and Physical Performance Level C (Standard Duty), Model 1 (Full Flush) and Model 2 (Seamless).
      a) Width: 1-3/4 inches or as indicated on Drawings.
   2. Level 2 and Physical Performance Level B (Heavy Duty), Model 1 (Full Flush) and Model 2 (Seamless).
   3. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush), Model 2 (Seamless) and Model 3 (Stile and Rail).
   4. Level 4 and Physical Performance Level A (Maximum Duty), Model 1 (Full Flush) and Model 2 (Seamless).

C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
   1. Level 1 and Physical Performance Level C (Standard Duty), Model 1 (Full Flush) and Model 2 (Seamless)].
      a) Width: 1-3/4 inches or as indicated on Drawings.
   2. Level 2 and Physical Performance Level B (Heavy Duty), Model 1 (Full Flush) and Model 2 (Seamless).

3. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush), Model 2 (Seamless) and Model 3 (Stile and Rail).
4. Level 4 and Physical Performance Level A (Maximum Duty), Model 1 (Full Flush) and Model 2 (Seamless).

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated from metallic-coated steel sheet.
1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as knocked down, face welded, and full profile welded unless otherwise indicated.
3. Frames for Level 1 Steel Doors: 0.042-inch-thick steel sheet.
4. Frames for Level 2 Steel Doors: 0.053-inch-thick steel sheet.
5. Frames for Level 3 Steel Doors: 0.053-inch-thick steel sheet.
6. Frames for Level 4 Steel Doors: 0.067-inch-thick steel sheet.

C. Interior Frames: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.
1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as knocked down, face welded, and full profile welded unless otherwise indicated.
3. Fabricate knocked-down, drywall slip-on frames for in-place gypsum board partitions.
4. Frames for Level 1 Steel Doors: 0.042-inch-thick steel sheet.
5. Frames for Level 2 Steel Doors: 0.053-inch-thick steel sheet.
6. Frames for Level 3 Steel Doors: 0.053-inch-thick steel sheet.
7. Frames for Level 4 Steel Doors: 0.067-inch-thick steel sheet.
8. Frames for Wood Doors: 0.053-inch-thick steel sheet.
9. Frames for Borrowed Lights: 0.053-inch-thick steel sheet or Same as adjacent door frame.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5 CUSTOM HOLLOW METAL DOORS

A. General: Provide doors not less than 1-3/4 inches thick, of seamless hollow construction unless otherwise indicated. Construct doors with smooth surfaces without visible joints or seams on exposed faces. Comply with ANSI/NAAMM-HMMA 861.

B. Exterior Door Face Sheets: Fabricated from metallic-coated steel sheet, minimum 0.053 inch thick.

C. Interior Door Face Sheets: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated, minimum 0.042 inch thick.

D. Core Construction: Provide thermal-resistance-rated cores for exterior doors and interior doors where indicated.
1. Steel-Stiffened Core: 0.026-inch-thick, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart, spot welded to face sheets a maximum of 5 inches o.c. Spaces filled between stiffeners with glass- or mineral-fiber insulation.

a) Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
b) Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 6.0 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.

E. Vertical Edges for Single-Acting Doors: Beveled 1/8 inch in 2 inches.

F. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.

G. Top and Bottom Channels: Closed with continuous channels, minimum 0.053 inch thick, of same material as face sheets and spot welded to both face sheets.

H. Hardware Reinforcement: Fabricate according to ANSI/NAAMM-HMMA 861 with reinforcing plates from same material as door face sheets.

2.6 CUSTOM HOLLOW METAL FRAMES

A. General: Fabricate frames of construction indicated. Close contact edges of corner joints tight with faces mitered and stops butted or mitered. Continuously weld faces and soffits and finish faces smooth. Comply with ANSI/NAAMM-HMMA 861.
1. Door Frames for Openings 48 Inches Wide or Less: Fabricated from 0.053-inch-thick steel sheet.
2. Door Frames for Openings More Than 48 Inches Wide: Fabricated from 0.067-inch-thick steel sheet.
3. Sidelight and Transom Frames: Fabricated from same thickness material as adjacent door frame.
4. Borrowed-Light Frames: Fabricated from 0.053-inch-thick steel sheet.

B. Exterior Frames: Formed from metallic-coated steel sheet.

C. Interior Frames: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.

D. Hardware Reinforcement: Fabricate according to ANSI/NAAMM-HMMA 861 with reinforcing plates from same material as frame.

E. Head Reinforcement: Provide minimum 0.093-inch-thick, steel channel or angle stiffener for opening widths more than 48 inches.

2.7 FRAME ANCHORS

A. Jamb Anchors:
1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:
1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.8 HOLLOW METAL PANELS

A. Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal work.

2.9 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

D. Terminated Stops: Where indicated on interior door frames, terminate stops 6 inches above finish floor with a 90-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.
   1. Provide terminated stops unless otherwise indicated.

2.10 LOUVERS

A. Provide louvers for interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020-inch-thick, cold-rolled steel sheet set into 0.032-inch-thick steel frame.
   1. Sightproof Louver: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.
   2. Lightproof Louver: Stationary louvers constructed with baffles to prevent light from passing from one side to the other, any angle.
   3. Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible link and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated by same testing and inspecting agency that established fire-resistance rating of door assembly.

2.11 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch-wide steel.

C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

2.12 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117 and ANSI/NAAMM-HMMA 861.

C. Hollow Metal Doors:
   1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

2. Glazed Lites: Factory cut openings in doors.
3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.

D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
6. Jamb Anchors: Provide number and spacing of anchors as follows:
    a) Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
    b) Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
    c) Compression Type: Not less than two anchors in each jamb.
    d) Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
    a) Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b) Double-Door Frames: Drill stop in head jamb to receive two door silencers.

E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8 and ANSI/NAAMM-HMMA 861.
2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections.

G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.

2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow metal work.
5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.13 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

B. Factory-Applied Paint Finish: Manufacturer's standard, complying with ANSI/SDI A250.3 for performance and acceptance criteria.
1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and HMMA 840.
   1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
      a) At fire-protection-rated openings, install frames according to NFPA 80.
      b) Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
      c) Install frames with removable glazing stops located on secure side of opening.
      d) Install door silencers in frames before grouting.
      e) Remove temporary braces necessary for installation only after frames have been properly set and secured.
      f) Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
      g) Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.
   2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
      a) Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
   3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
   4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
   5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
   6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
   7. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
   8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
   9. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
      a) Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
      b) Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
      c) Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
      d) Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
   1. Non-Fire-Rated Standard Steel Doors:
      a) Jambs and Head: 1/8 inch plus or minus 1/16 inch.
      b) Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
      c) Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
      d) Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
   2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
   3. Smoke-Control Doors: Install doors according to NFPA 105 and UBC Standard 7-2.

D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.
   1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

SECTION 081216
ALUMINUM FRAMES

PART 1 – GENERAL

1.1 SUMMARY

A. Work Included: Provide framing system to receive up to 1/2" thick butt glazed tempered glass panels at top, bottom and side. Material will be aluminum channels with clear silicon glazing sealant, channel finish and color to be specified.

1.2 SUMMARY

A. Section Includes
   1. Interior aluminum frames for doors installed in gypsum board partitions.
   2. Interior aluminum frames for glazing installed in gypsum board partitions.
   3. Interior aluminum doors.

1.3 QUALITY ASSURANCE

A. Standards: Comply with recommended specifications of the A.W.M.A., except to the extent more stringent requirements are indicated.

B. Separate all dissimilar metals by providing means of permanent separation at all points of contact.

C. Manufacturers: Subject to compliance with the requirements, provide products manufactured by Kawneer, EFCO, Mid-States Aluminum Corp., Temroe Metals, Precision Extrusions, Inc., Cardinal Aluminum Co., Light Metals Corp., Fab Masters Co., Inc., Talan Products Inc., Or Approved Equal.

D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
   1. Build mockup of each type of aluminum frame and door in typical wall area as shown on Drawings.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 SUBMITTALS

A. Manufacturer's Data: Submit manufacturer's specifications, recommendations and standard details for each type of unit required. Include information on fabrication methods, finishing and accessories.

B. Product Data: For each type of product
   1. Include construction details, material descriptions, dimensions of individual

components and profiles, fire-resistance rating and finishes.

C. Shop Drawings: Submit shop drawings for fabrication and installation of all work and associated components of work. Include elevations at 1/4" scale, typical unit elevations at 1: scale and full-size section details of every typical composite member. Show glazing channel for glass specified in Section 088000. Indicate preparation of aluminum frames to receive up to 1/2" glass panels.

D. Shop Drawings: For aluminum frames
   1. Include elevations, sections, and installation details for each wall-opening condition.
   2. Include details for each frame type, including dimensioned profiles and metal thicknesses.
   3. Include locations of reinforcements and preparations for hardware.
   4. Include details of anchorages, joints, field splices, connections, and accessories.
   5. Include details of moldings, removable stops, and glazing.

E. Samples: Submit three (3) samples of each specified finish, on 12" lengths of each member including corner construction. Samples will be reviewed for color and finish only. Compliance with other requirements is exclusive responsibility of Contractor.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum frames to include in maintenance manuals.

PART 2 – PRODUCTS

2.1 GENERAL

A. Aluminum framing for glass panels shall be 1-3/4" x 4-1/2" storefront framing with 4- 1/2" x 4-1/2" base and shall include all accessories as necessary 10 complete the installation as shown.

B. Provide adapter members for frame sections to receive up to 1/2" glass in-fills.

C. Glass and glazing materials specified in Section 088000.

2.2 MATERIALS

A. Aluminum frame members shall be manufacturer's extruded shapes of AA-6063-TS and temper, alloy as designed by approved manufacturer to comply with all requirements.

B. Provide tubular frame, aluminum comer tube and aluminum sub-frame of dimensions required. Provide custom components where necessary to provide profiles as detailed and dimensioned on Drawings.

C. Trim Members: As required "trim" includes glazing beads, channels, stops and similar items not of prime structural importance. Provide gauges required.

D. Mullions: Horizontals. Sub-frames: Aluminum extruded shapes of profile shown or if not shown, manufacturer's standard for span and spacing indicated.

E. Installation Accessories: Provide accessories as indicated or required for complete and proper installation. Components shall be single, full length extrusions. No splicing will be permitted.

F. Fasteners shall be of metal guaranteed by manufacturer to be non-corrosive and compatible with frame members, trim, hardware, anchors and other components of frame units. Provide exposed fasteners (if any) which match finish of member or hardware being fastened. Provide Phillips flathead machine screws for exposed fasteners.

G. See Section 088000 for sealants and glass setting materials.

2.3 PERFORMANCE REQUIREMENTS

A. Fire-Rated Frames: Frames for fire-rated door assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Oversize Fire-Rated Frames: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that frames comply with standard construction requirements for tested and labeled fire-rated frames except for size.
2. Frames for Smoke- and Draft-Control Assemblies: Tested according to UL 1784 and installed in compliance with NFPA 105.
    a. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (0.9 cu. m per minute/sq. m) at the tested pressure differential of 0.3-inch wg (75 Pa).

2.4 FABRICATION

A. General: Provide manufacturer's standard fabricated framing, accessories, and finish, except to extent more specific or more stringent requirements are indicated. Include complete system of anchorage for work and prepare units for glazing from both sides.

B. Sizes and Profiles: Sizes and profile requirements for all work as required. Variable dimensions (if any) are indicated along with maximum and minimum dimensions as required to achieve design requirements and coordination with other work.

C. Coordination of Fabrication: Check actual openings in construction work by accurate field-measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress as required to avoid delay of work. Where necessary, proceed with fabrication without all field measurements, and coordinate installation tolerances to ensure proper lit of frame units. Extend and attach frame to structure as required. Carefully coordinate with existing conditions prior to preparation of shop drawings.

D. Glazing Stops: Provide screw-applied or snap-on glazing stops (beads), coordinated with glass types and glazing system as specified herein and required in Section 088000. Finish glazing stops to match frame units. Units shall be capable of being glazed from both sides.

E. Installation Accessories: Provide all accessories required for complete and proper installation. Components shall be single-piece, full length extrusions.

F. Provide concealed corner reinforcements and alignment clips for accurately fitted hairline joints at butted and mitered connections.

G. Factory prepare aluminum frames to receive templated mortised hardware; include cutouts, reinforcements, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Section 087100 "Door Hardware."

1. Locate hardware cutouts and reinforcements as required by fire-rated label for assembly.

H. Fabricate frames for glazing with removable stops to allow glazing replacement without dismantling frame.
1. Locate removable stops on the inside of spaces accessed by keyed doors

I. Fabricate components to allow secure installation without exposed fasteners.

2.5 SHOP FINISH

A. Aluminum materials shall be finished with manufacturer's standard baked enamel finish to match approved color sample. Color shall be selected by Architect from manufacturer's full range of standard colors.
1. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
2. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine the supporting structure and coordinate work with conditions under which it is to be erected. Notify DCAS in writing of conditions detrimental to proper and timely completion or work. Do not proceed with erection until unsatisfactory conditions have been corrected.

B. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

C. Verify that wall thickness does not exceed standard tolerances allowed by throat size of indicated aluminum frame.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Do not install component parts which are observed to be defective in any way, including warped, bowed, racked, dented, abraded and broken units or members. Remove and replace units which have been damaged during installation or thereafter before time or final acceptance.

B. Do not cut, trim, weld or braze component parts during erection in any manner which would damage finish, decrease strength, or result in visual imperfection or failure in performance of work. Return component parts which require alteration to shop for refabrication, if possible, or for replacement by new parts.
   1. At fire-protection-rated openings, install fire-rated frames according to NFPA 80 and NFPA 105.

C. Install component parts level, plumb, true to line and with uniform joints and reveals. Secure to structure with non-staining and on-corrosive shims, anchors, fasteners, spacers and fillers, Use erection equipment which will not mar or stain finished surface, and will not damage component parts in any way.

D. Comply with manufacturer's specifications and recommendations for the installation of units, hardware, operators and other components of the work.

E. Set all members plumb, level, and true to line, without warp or rack of frames. Anchor securely in place.

F. Separate dissimilar metal surfaces from sources of corrosion or electrolytic action of points of contact with other materials by approved means.

G. Refer to Section 088000 for glazing installation requirements.

H. Advise DCAS of protective and other precautions required through remainder or construction period, to ensure that work will be without damage or at time of acceptance.

3.3 PROTECTION AND CLEANING

A. Before shipment from manufacturer's plant, all aluminum work shall be adequately protected as recommended by Aluminum Association on all finished and exposed surfaces so as to ensure delivery at site in undamaged and unblemished condition.

B. Installer shall adequately protect work included herein against damage at all times, and shall repair or replace all defective or damaged work, so as to leave all components in condition satisfactory to Architect upon completion of project. Scratches in finish shall not be perceptible by Architect from 4 feet when project is ready for final acceptance.

C. Installer shall thoroughly clean all exposed surfaces or work upon completion of all other work liable to cause soiling of these surfaces and before acceptance by Architect.

D. Cleaning of new and existing surfaces shall follow applicable procedures described in the following publications of Aluminum Co. of America shall be followed, and are hereby made a part or this Specification:
   1. "Care During Construction."
   2. "Cleaning and Maintenance."

E. Special precautions to be observed in protecting and cleaning the finish shall follow coating manufacturer's recommendations.

3.4 ADJUSTING

A. Inspect installation, correct misalignments, and tighten loose connections.

B. Doors: Adjust doors to operate smoothly and easily, without binding or warping. Adjust hardware to function smoothly, and lubricate as recommended by manufacturer.

C. Clean exposed frame surfaces promptly after installation, using cleaning methods recommended in writing by frame manufacturer and according to AAMA 609 & 610.

D. Touch Up: Repair marred frame surfaces to blend inconspicuously with adjacent unrepaired surface so touchup is not visible from a distance of 48 inches (1220 mm) as viewed by Architect. Remove and replace frames with damaged finish that cannot be satisfactorily repaired.

3.5 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

END OF SECTION 081216

SECTION 081416
FLUSH WOOD DOORS

PART 1- GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SUMMARY

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the wood doors as shown on the drawings and/ or specified herein, including but not limited to, the following:
   1. Solid core doors with wood veneer faces.
   2. Shop priming of flush wood doors.
   3. Factory finishing of flush wood doors.
   4. Factory fitting flush wood doors to frames and factory machining for hardware.
   5. Louvers for flush wood doors.

1.3 RELATED SECTIONS

A. Installation of wood doors- Section 062000.

B. Division 6 Section “Interior Architectural Woodwork

C. Hollow metal frames- Section 081113.

D. Finish hardware- Section 087100.

E. Glass and glazing – Section 088000.

1.4 SUBMITTALS

A. Product data for each type of door, including details of core and edge construction, trim for openings, louvers, or glazing and factory-finishing specifications.
   1. Include details of core and edge construction and trim for openings.
   2. Include factory finish specifications.
   3. Include certifications to show compliance with specifications.
   4. Include certification to show compliance with WDMA TM-7 test for 1 million slams.

B. Shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for veneer matching and factory finishing and other pertinent data.
   1. Include requirements for veneer matching.
   2. For factory-machined doors, indicate dimensions and locations of cutouts for locksets and other cutouts adjacent to light and louver openings.

C. Samples for initial selection in the form of color charts consisting of actual materials in small sections for the following:
   1. Faces of factory-finished doors with transparent finish. Show the full range of colors available for stained finishes.
   2. Samples for verification in the form and size indicated below:
      a. Corner sections of doors approximately 12 inches square with door faces and edgings representing the typical range of color and grain for each species of veneer and solid lumber required. Finish sample with same materials proposed for factory-finished doors.
      b. Louvers consisting of blade and frame, 6 inches long, for each material and finish specified.
      c. Frames for light openings, 6 inches long, for each material, type, and finish required.
      d. Glazing as specified, 6 inches by 6 inches, sample to have beveled smooth edges.

D. Submit the following:
   1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

1.5 QUALITY ASSURANCE

A. NWWDA Quality Standard: I.S.1-A, “Architectural Wood Flush Doors,” of the National Wood Window and Door Association.

B. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

C. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated"; latest edition "Premium" grade.
   1. Only manufacturers that are certified and listed by AWI to be QCP qualified are acceptable for this project.
   2. Provide letter of licensing for Project indicating that doors comply with requirements of grade specified.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration.

B. Comply with requirements of referenced standard and manufacturer’s instructions.

C. Comply with requirements of referenced standard and manufacturer's written instructions.

D. Package doors individually in plastic bags or cardboard cartons.

E. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is

complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.8 GUARANTEES

A. Special Guarantee: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified guarantee period.
   1. Failures include, but are not limited to, the following:
      a. Warping (bow, cup, or twist) more than 1/4-inch (6.4 mm) in a 42-by-84- inch (1067-by-2134-mm) section.
      b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3- inch (0.25 mm in a 76.2-mm) span.
         1. Guarantee shall also include installation and finishing that may be required due to repair or replacement of defective doors.
         2. Guarantee Period for Solid-Core Exterior Doors: 5 Years from final acceptance of the Work.
         3. Guarantee Period for Solid-Core Interior Doors: 5 Years from final acceptance of the Work.
         4. Guarantee Period for Hollow-Core Interior Doors: 5 Years from final acceptance of the Work.

B. Furnish a guarantee in the form specified in Article on “GUARANTEES” of the General Conditions

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) in excess of permitted standard noted in Article 2.5 herein, or show telegraphing of core construction in face veneers.
   1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
   2. Warranty shall be in effect during the following period of time from date of Substantial Completion:
      a. Solid Core Flush Wood Doors: Life of installation.

PART 2- PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering doors that may be incorporated in the Work include, but are not limited to, the following.
   1. Solid Core Doors.
      a. Eagle Plywood & Door Manufacturing, Inc.
      b. Eggers Industries, Architectural Door Division.
      c. Oshkosh Architectural Door Company.
      d. Mohawk Flush Doors, Inc.; a Masonite company.
      e. Or an Approved Equal.

2.2 INTERIOR FLUSH WOOD DOOR

A. Solid Core Doors for Transparent Finish: Comply with the following requirements.
   1. Faces: AAA@ of either Red Oak/Maple rift sawn/Birch unless otherwise indicated.
   2. Grade: AWI Premium
   3. Construction: 5 plies
   4. Core: Particleboard core
   5. Bonding: Stiles and rails bonded to core, then entire unit abrasive planed before veneering.

B. Solid Core Doors for Opaque Finish: Comply with the following requirements.
   1. Faces: Any closed-grain hardwood of mill option.
   2. Grade: AWI Premium.
   3. Construction: 5 plies.
   4. Core: Particleboard core.
   5. Bonding: Stiles and rails bonded to core, then entire unit abrasive planed before veneering.

2.3 VENEER MATCHING

A. Within Door Faces: Provide doors with the following veneer matching:
   1. Balance matching.

B. Pairs and Sets: Provide pair matching and set matching for pairs of doors and for doors hung in adjacent sets.

C. Doors with Transoms: Provide the following matching.
   1. End matching.

2.4 LOUVERS

A. Metal Louvers: Size, type, and profile shown and fabricated from the following:
   1. Galvanized Steel: 0.0396 inch thick; hot dip, zinc coated, and factory primed for paint finish.

2.5 FABRICATION

A. Fabricate flush wood doors to comply with following requirements:
   1. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels.
      a. Comply with the tolerance requirements specified herein. Machine doors for hardware requiring cutting of doors. Comply with final hardware scheduled and door frame shop drawings, and with hardware templates and other essential information required to ensure proper fit of doors and hardware.
      b. Three-degree bevel or bevel to suit frame sizes indicated, with 3/16" prefit in width, +0/-1/32" tolerances. Prefit top of door 1/8" + 1/16"/-0" and undercut as required by floor condition. Undercut shall not exceed 1/8" from bottom of door to top of finished floor; where threshold occurs undercut shall not exceed 1/8" from bottom of door to top of threshold.
   2. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame shop drawings, DHI A115-W series standards, and hardware templates.

a. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory machining.

B. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors.
1. Fixed Transom Panels: Fabricate fixed panels with solid lumber transom bottom rail and door top rail, both rabbeted as indicated. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.

C. Take accurate field measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with machining in the factory.

D. Doors shall be factory sized to door opening so that trimming and fitting are not required in the field.

E. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Louvers: Factory install louvers in prepared openings.

2.6 SOLID CORE FLUSH WOOD DOORS

A. Provide AWI PC-5 Premium Grade hot pressed 5-ply solid core particleboard doors, 2-1/4" thick, conforming to standards specified herein. Subject to meeting standards specified herein, the following manufacturers are acceptable: Marshfield Door Systems, Inc., Algoma Hardwoods Inc., or Eggers Hardwood Products Corp; Or an Approved Equal.
1. Core shall consist of a formed flat panel consisting of wood particles bonded together with synthetic resins or other added binder, with an average density of 30 to 32 lbs. per cubic foot. The material shall meet or exceed the requirements of ANSI A208.1, Grade 1-LD-2 covering mat formed particleboard with face screw holding of 124 lbs., modulus of rupture of minimum 700 psi and modulus of elasticity of not less than 148,000 psi.
2. Core shall be capable of satisfying this WDMA TM-7 cycle slam test for 1 million slams for surface mounted hardware. Where the manufacturer's core does not meet this criteria, stiles and rails must measure a minimum of 5-1/2" and must be fabricated of hardwood.
a. Surface mounted hardware must be installed with 1-1/4" screw penetrations using threaded to the head screws; coordinate with Section 087100.

B. Cross Bands: Shall be 1/16" thick hardwood extending full width of door and laid with grain at right angles to face veneers. Cross bands and faces shall be laminated to the core with Type I MF or PVA glue.

C. Stiles, Rails: Stile edge bands shall be a minimum of 1-3/8" solid hardwood or structural composite lumber (after trimming) laminated to the core. Stiles and rails must be securely glued to the core with no voids allowed.

D. Doors with transparent finish to have center balanced, slip matched, quarter sliced, select veneer provided by Architect. Veneer to conform to AWI, "AA" grade veneer with 3" wide leaf. Minimum veneer thickness shall be not less than 1/50" after sanding.

E. Where glass lites are noted, factory cut openings. Trim openings with solid hardwood moldings of

same type of wood as face veneer. Lite openings in 20-minute rated doors shall have manufacturer's 20-minute approved hardwood system.

F. Door frame size to be coordinated with door leaf to maintain the minimum required clearances and to accept the specified sound seals.

2.7 SHOP PRIMING

A. Doors for Opaque Finish: Shop prime exposed portions of doors for paint finish with one coat of wood primer specified in Division 9 Section “Painting”.

2.8 FACTORY FINISHING

A. General: Comply with referenced quality standard’s requirements for factory finishing.

B. Finish wood doors at factory.

C. Transparent Finish: Comply with requirements indicated for grade, finish system, staining effect, and sheen.
1. Grade: Premium
2. Finish: AWI System TR-4 conversion varnish.
3. Staining: Stain to match approved sample for color
4. Effect: Filled finish, unless otherwise indicated.
5. Sheen: Satin, unless otherwise indicated

D. Transparent Finish: Finish in the shop with clear satin catalyzed polyurethane finish conforming to AWI System “Catalyzed Polyurethane Transparent”.

2.9 SOURCE QUALITY CONTROL

A. Once installed, maximum allowable warp, bow, cut or twist in doors shall be 1/16" as measured by the 1/16-inch feeler gauge and a straight-edge extending from corner to corner of the door face at stiles, top and bottom rails and along both diagonals.

PART 3- EXECUTION

3.1 EXAMINATION

A. Examine installed door frames prior to hanging door.
1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
2. Reject doors with defects.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation see Division 8 Section “Door Hardware.”

B. Manufacturer's Instructions: Install wood doors to comply with manufacturer's instructions and referenced quality standard and as indicated.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation, if fitting or machining is required at the job site.

E. Field-Finished Doors: Refer to the following for finishing requirements.
   1. Division 9 Section "Painting."

F. Grout fill frames set in walls of masonry or concrete.

G. Fill frames with glass/mineral fiber when set in drywall-only and exterior frames.

H. Stop molding set in bed of sealant and screwed to frame.

I. Use wire-stirrup type frame jamb anchors for grout filled frames.

J. Door height and door bottom to be coordinated to ensure positive, light-tight seal against floor. Doors cut too short must be replaced. Size door for 3/8-inch clearance from bottom of door to top of threshold.

K. Mortise for door bottom seal where required.

3.3 ADJUSTING AND PROTECTION

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Refinish or replace doors damaged during installation.

C. Protect doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration at the time of Substantial Completion.

3.4 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

B. All above dimensions are approximate and final dimensions will be based on design and shop drawings.

C. All flush wood doors shall include the furnishing and installation of wood door frames and trim to match (or factory primed steel door frames), hardware installation, finish, louvers and glazing as indicated by the Architect or DCAS, deemed included in the Unit Price, and at no additional cost to the City.

END OF SECTION 081416

SECTION 083113
ACCESS DOORS AND FRAMES

PART 1- GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 RELATED SECTIONS

A. Masonry- Section 042000.

B. Ceramic tile- Section 093000.

1.3 QUALITY ASSURANCE

A. Basis of Design: When particular manufacturers' materials, products or processes are specified for an item of Work, any one is acceptable for the Subcontractor to choose. An alternative material, product or process will be considered if the Subcontractor submits a written substitution request together with such information as may be necessary to assist the Consultant in determining whether the proposed substitution is acceptable, the burden of proof rests solely upon the Subcontractor.

B. Qualified Installer: The access doors and panels work shall be performed by a firm having 5 years' experience in the installation of specified materials on comparable projects. The firm shall have the approval of the access doors and panels manufacturer. The applicator shall provide evidence of successful completion of work of similar scope to that shown and specified for this Project using similar access doors and panels systems.

C. Manufacturer Qualifications: Provide access doors and panels manufactured by a firm specializing in the production of access door work for not less than 5 years. Fabricate access doors and panels as a single integral unit with frame, anchors, hardware, accessory parts, fittings, and fastenings. Units are to be the standard products, or modifications if required, of one of the listed manufacturers.
   1. Single-Source Responsibility: Obtain each type of access door for the entire project through one source from a single manufacturer.
   2. Size Variations: Obtain Consultant's acceptance of manufacturer's standard size units, which may vary slightly from sizes indicated.

D. Verification: Obtain specific locations and sizes for required access doors and panels from trades requiring access to concealed equipment and indicate on access door schedule submittal.

E. Coordination: Furnish inserts and anchoring devices which must be built into other work for installation of access doors. Coordinate delivery with other work to avoid delay.

F. For actual installation of the work of this Section, use only personnel who are thoroughly familiar with the manufacturer's recommended methods of installation and who are completely trained in the skills required.

G. Fire-Resistance Ratings: Wherever a fire-resistance classification is shown, or for construction

where access doors are installed, provide required access door assembly with panel door, frame, hinge, and latch from manufacturers listed in Underwriters' Laboratories, Inc. "Classified Building Materials Index" for the rating shown.

1. Provide UL label on each access panel.
2. Provide flush, key operated cylinder lock.

H. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units which may vary slightly from sizes shown or scheduled.

1.4 SUBMITTALS

A. Product Data: Submit for Consultant’s action. Submit manufacturer’s literature, specifications and installation instructions describing the general properties of each material and accessory to be used in the Work for each type of access door and panel assembly, including instructions, and directions for installation of anchorage devices. Include maintenance instructions for doors with exposed factory finishes.

B. Shop Drawings: Submit for Consultant’s action. Submit shop drawings for the fabrication and installation of the Work including details of each frame type, elevations of door design types, anchorage, and accessory items. Prepare details at not less than 3 in. = 1 ft. minimum scale.

1. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items with concealed framing, suspension systems, piping, ductwork, and other construction. Show the following.
    a. Method of attaching door frames to surrounding construction.
    b. Ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim.

C. Samples: Submit samples for Consultant’s action. Label samples to indicate product, characteristics, and location in the Work. Samples will be reviewed for color and appearance only. Furnish sufficient samples to establish the full range of colors and textures for materials exposed in the finished work. Compliance with other requirements is the responsibility of the Subcontractor. Provide sample for each access door face material, at least 3 in. x 5 in. in size, in specified finish.

D. Access Door Schedule: Submit, for Consultant’s information, complete access door and panel schedule, including types, ratings, general locations, sizes, wall and ceiling construction details, finishes, latching or locking provisions, and other data pertinent to installation.

E. Quality Control Submittals: Submit for Consultant’s information.

1. Certificates
    a. Document Review: Before commencing work, submit a written statement signed by the Subcontractor and the Applicator certifying that the Contract Documents, shop drawings and product data have been reviewed with material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.

F. Before any materials of this Section are delivered to the job site, submit complete manufacturer's literature to the Architect. Submit plans and schedules showing size and location of each access door for Architect's acceptance prior to installation.

1.5 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2- PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide access doors as manufactured by one of the following.
   1. Base: J.L. Industries
   2. Milcor Inc.
   3. Karp Associates Inc.
   4. Or an Approved Equal.

2.2 MATERIALS AND FABRICATION

A. General: Furnish each access door assembly manufactured as an integral unit, complete and ready for installation.

B. Sizes: Minimum 12” x 12” at walls, 18” x 18” at ceilings and as indicated or required to allow inspection of items requiring service, maintenance, or repair.

C. Steel Access Doors and Frames: Fabricate units of continuous welded steel construction. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels properly.

D. Frames: Fabricate from 14-gage steel except security frames shall be 12-gage, with exposed flange approximately 1” wide around perimeter of frame for units installed in the following construction.
   1. Exposed masonry.
   2. Security ceilings.

E. Flush Panel Doors: Fabricate from not less than 16-gage sheet steel except security doors shall be 12-gage, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees. Prime with manufacturer’s factory-applied baked enamel prime paint. Finish painting refer to Section 099000. Reinforce doors as required to prevent buckling.
   1. Fire Rated Doors: Provide manufacturer’s standard insulated flush panel doors, automatic closer with positive latching, interior release device, with continuous piano hinge.
   2. Recessed Doors: Fabricate with face of panel recessed, where required to receive applied finish.
   3. Locking Devices: Furnish flush locks to hold door in flush, smooth plane when closed. Provide security locking with flush cylinder lock per access door. Furnish 2 keys per lock and key all locks keyed alike to the building system.
   4. In areas where access doors cannot be provided, Folger Adam 416 access panels shall be provided with Folger Adam No. 12 dead lock.

F. Cold Rolled Carbon Steel Sheets: ASTM A366; commercial quality, stretcher leveled, free from

scale, pitting or other defects.

G. Steel Angles, Plates, Bars, Rods and Other Steel Accessories: ASTM A36.

H. Stainless Steel
1. ASTM A240; Provide the most suitable austenitic alloy, form and finish required to produce the Work. Provide Type 304 or Type 316 and low carbon Type 304L or 316L for components to be welded, unless otherwise noted.
2. Plate and Sheet: ASTM A480, Stretcher level sheets.
3. Bar Stock and Shapes: ASTM A276.

I. Fasteners and Anchorage Devices: Provide fasteners complying with the requirements of Industrial Fasteners Institute standards. Type, grade, class and style best suited for the respective purpose. Use countersunk flat-head Phillips type machine screws for exposed fasteners, except where Allen head screws are required. Use galvanized steel or stainless-steel fasteners for exterior construction and for fastening components fabricated of galvanized steel.
1. Provide Type 304 or Type 316 stainless steel fasteners for exterior use and zinc plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls and fastening components fabricated of galvanized steel.

J. Finishes
1. Ferrous Metal Finish: Chemically bonded with prime coat of baked-on electrostatically applied primer.
2. Stainless Steel: (Type MTL01) No. 4 (bright directional polish) unless otherwise shown or specified.

2.3 FABRICATION, GENERAL

A. General: Provide each access door assembly manufactured as an integral unit, complete with components, accessories, and fasteners ready for installation.

B. Forming: Form exposed surfaces free from warp, wave, and buckle, with corners square, unless otherwise shown. Form molded members straight and true, with welded joints coped or mitered, well formed, and in true alignment. Dress welded joints on exposed surfaces smooth so they are invisible after finishing and flush with adjacent surfaces. Provide attachment devices and fasteners of type required to secure access doors and frames to contiguous support construction.

C. Reinforcing: Reinforce members and joints with structural shapes and plates in concealed locations, as necessary for adequate strength and rigidity. Provide concealed fastenings unless otherwise shown. Locate necessary exposed fastenings in an orderly pattern, in accordance with reviewed shop drawings. Separate dissimilar metals with dielectric separator to prevent galvanic action. Do not extend coatings onto exposed surfaces.

D. Locations: Access doors, panels, related frames, and accessories to be located in exterior areas, areas of high humidity or other locations noted, shall be hot dip galvanized and finish painted. Factory prime mild steel not galvanized. Access doors and panels exposed to public view shall be finish painted in color(s) as selected by the Consultant.

E. Locking Devices: Provide locking devices for access doors and panels in sufficient number for the size door to be installed. Provide six extra keys for keyed locks and master key locks for the entire

project unless otherwise indicated or specified.

F. Strippable Protection: Prior to shipment protect finishes on exposed surfaces from damage by application of strippable temporary protective covering or other means.

2.4 FABRICATION, ACCESS DOORS AND PANELS

A. Stainless Steel Flush Access Door for Installation in Ceramic Tile Substrates (Type ADR01)
   1. Features: Frame shall be 16-gauge stainless steel with a nominal 1 in. exposed frame flange. Door shall be 14-gauge stainless steel, fitted flush with frame flange. Reinforce access doors over 24 in. in width to prevent sagging. Provide galvanized steel anchors appropriate for substrate. Provide concealed spring hinges permitting 175o opening. Provide flush key operated stainless steel cylinder locks.
   2. Provide one of the following:
      a. "Style TMS" (J. L. Industries).
      b. "Type DSC-214M Stainless Steel" (Karp Associates, Inc.).
      c. "Style MS" (Milcor).
      d. "NT Series Stainless Steel" (Nystrom, Inc.).
      e. Or an Approved Equal.

B. Recessed Pan-Type Access Door for Installation in Drywall Substrates and Veneer Plaster Substrates Type ADR02).
   1. Features: 1 in. deep recessed mounting flange shall be 16-gauge steel with an integral 3 in. galvanized self-furring steel lath. Door shall be 16-gauge steel, recessed for drywall installation in door face. Provide concealed pivoting rod type hinges permitting 175o opening and flush key operated stainless steel cam locks with automatic dust shutters and welded sleeves.
   2. Provide one of the following:
      a. "DW 5015-5010" (Acudor Access Doors).
      b. "Type RDW" (Karp Associates, Inc.).
      c. " RW Series" (Nystrom, Inc.)
      d. Or an Approved Equal.

C. Flush Access Door for Installation in Masonry Substrates (TypeADR03).
   1. Features: Frame shall be 16-gauge steel with a nominal 1 in. exposed frame flange. Door shall be 14-gauge steel, fitted flush with frame flange. Reinforce access doors over 24 in. in width to prevent sagging. Provide galvanized steel anchors appropriate for substrate. Provide concealed spring hinges permitting 175o opening. Provide flush screwdriver operated cam locks for access doors except provide flush key operated cylinder locks for access doors in public areas.
   2. Provide one of the following:
      a. "Style TM" (J. L. Industries).
      b. "Type DSC-214M" (Karp Associates Inc.).
      c. Style M" (Milcor).
      d. Or an Approved Equal.

D. Flush Access Door for Installation in Back of House Drywall Substrates (Type ADR04).
   1. Features: Frame shall be 16-gauge steel with an integral galvanized steel drywall bead. Door shall be 14-gauge steel, fitted flush with 22-gauge galvanized steel integral drywall bead. Provide concealed spring hinges permitting 175o opening. Provide flush screwdriver operated cam locks for access doors except provide flush key operated cylinder locks for access doors in

public areas.

2. Provide one of the following:
    1. "Style WB" (J. L. Industries).
    2. "Type KDW" (Karp Associates Inc.).
    3. "NW Series" (Nystrom, Inc.).
    4. Or an Approved Equal.

2.5 FABRICATION, FIRE RATED DOORS

A. General: Construct doors and frames to comply with the requirements of the NFPA and Underwriters' Laboratories, Inc. for "B" Label, 1-1/2 hour rating. Install UL label on each door in a non-exposed location unless otherwise required by the local authority having jurisdiction.

B. Fire Rated Steel Access Door (Type ADR05)
    1. Features: Frame shall be 16-gauge steel with a nominal 1 in. frame flange and integral appropriate anchors. Door shall be 2 in. thick, fabricated of 20-gauge steel face sheets, sandwich construction, with a non-combustible insulation core. Provide continuous stainless steel piano type hinge with stainless steel pin for the length of the door and an automatic latching device with operating turn ring (flush key operated cylinder lock in public areas) and interior latch release. Provide an automatic spring door closer for doors.
    2. Manufacturers
        a. "Style FD" (J. L. Industries).
        b. "Type KRP-150FR" (Karp Associates, Inc.).
        c. " IT Series" (Nystrom, Inc.).
        d. Or an Approved Equal.

2.6 FABRICATION, FLOOR ACCESS DOOR

A. General: Construct doors and frames to comply with the requirements of the NFPA and Underwriters' Laboratories, Inc. for "B" Label, 1-1/2 hour rating. Install UL label on each door in a non-exposed location unless otherwise required by the local authority having jurisdiction.

B. Fire Rated Floor Door Type FDR01
    1. Features: Frame shall be extruded aluminum frame with built-in anchor flange around the perimeter. Intumescent fire coating applied on the interior surface of the frame. Cover: shall be reinforced to support a minimum live load of 150 psf (732 kg/m2) with a maximum deflection of 1/150th of the span. Door and frame assembly shall be tested in accordance with ASTM E119 and NFPA 251 and UL Listed as having a 2-hour fire rating when exposed to fire from the underside. In the closed position, the temperature on the unexposed surface of the door shall not exceed 325°F (162°C) above ambient for the duration of the 2-hour period. Manufacturer shall submit a test report certifying this performance. Door shall be equipped with a fusible link activated closing system that will automatically close and latch the door leaf in the event of fire when heat parts the UL Listed 165° (74°C) fusible link. Cover: Shall have a 1” (25.4mm) fillable pan to receive concrete or a combination of concrete and epoxy resin finish. Lifting mechanisms: Manufacturer shall provide the required number and size of compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and to act as a check in retarding downward motion

of the cover when closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe fastened to a formed 1/4" (6.3 mm) gusset support plate. Hinges: Shall be a continuous heavy-duty Type 316 stainless steel hinge that is accessible only when the cover is in the open position. Hardware: Compression spring tubes shall be an anti- corrosive composite, all fasteners shall be Type 316 stainless steel material, and all other hardware shall be zinc plated and chromate sealed.

2. Manufacturer
   a. "Type FR" (Bilco).
   b. "FCRM Series" (Nystrom).
   c. "KFD-HD (Karp).
   d. Or an Approved Equal.

PART 3- EXECUTION

3.1 GENERAL

A. Manufacturer's Instructions: Prepare substrates and install the work of this Section, including components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

3.2 EXAMINATION

A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Subcontractor shall remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected. Do not hang doors with an apparent defect.

3.3 PREPARATION

A. Substrate Acceptability: Commencement of installation shall constitute acceptance of substrate conditions by the Installer.

3.4 INSTALLATION

A. Verification of Dimensions: Verify dimensions of openings by field measurements so that access doors and related items will be accurately designed, fabricated, and fitted to the substrate.

B. Coordination: Coordinate access doors and panels with the work of other Sections and provide items to be placed during the installation of other work. Coordinate delivery of such items to the project site. Deliver items which are to be built into the work of other Sections in time so as not to delay the progress of the Work.

C. Installation: Install access doors and panels in locations shown, plumb, level and in line with adjacent materials where required. Provide fastenings as indicated on the final shop drawings. Fit exposed connections accurately together to form tight hairline joints. Adjust hardware and doors for proper operation.

D. Installation of Fire Rated Access Doors: Install fire rated items in a manner which will not compromise the ratings of the substrate where installation is scheduled.

3.5 ADJUST AND CLEAN

A. Adjust hardware and panels after installation for proper operation.
B. Remove and replace units which are warped, bowed or damaged.

C. Cleaning: Clean surfaces and leave free from smears. Repair minor scratches and other finish imperfections. Immediately after erection, clean field welds, bolted connections, marred and abraded surfaces. Remove and replace panels or frames that are warped, bowed, or otherwise damaged.

D. Touch-Up: Paint and touch-up paint with the specified paint system. Touch up galvanized surfaces in accordance with ASTM A780.

E. Adjustment: Adjust doors and hardware after installation for proper operation.

F. Damaged Doors: Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

3.6 PROTECTION

A. Protection: Protect finished surfaces against damage during construction and remove protection at time of substantial completion.

3.7 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

END OF SECTION 083113

SECTION 084113
ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1- GENERAL

1.1 SUMMARY

A. Work Included: Provide swing entrance assemblies in accordance with the Contract Documents. The Work of this Section shall include but not be limited to the following:
   1. Aluminum entrance doors and frames.
   2. Aluminum balanced entrance doors and frames.
   3. Bronze balanced entrance doors and frames.

B. Related Sections
   1. Division 7 Section – “Joint Sealers”.
   2. Division 8 Section – “Door Hardware”.
   3. Division 8 Section – “Automatic Door Operators”.
   4. Division 8 Section – “Glazing”.

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum and bronze entrances that comply with specified performances, as proven by testing corresponding stock assemblies in accordance with specified test methods.

B. Thermal Movement: Provide systems capable of withstanding thermal movements resulting from a metal temperature range of 180 deg. F.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer’s specifications, technical data, standard details, and installation recommendations. Include fabrication methods, finishing and accessories.

B. Shop Drawings: Submit shop drawings for fabrication and installation of entrances, including elevations, detail sections of composite members, anchorages, hardware, reinforcements, expansion provisions and glazing details. Include a complete glazing schedule coordinated with shop drawings.
   1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
   2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following.
      a. Joinery, including concealed welds.
      b. Anchorage.
      c. Expansion provisions.
      d. Glazing.
      e. Flashing and drainage.
   3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

C. Samples: Submit samples of each aluminum finish, on 12” long extrusions or formed shapes and on 6” square sheets.
   1. When requested, submit samples of fabricated sections, to show quality of workmanship

and finish, before fabrication.

D. Test Reports: Provide certified test results showing that entrance assemblies have been tested by a recognized testing laboratory or agency and comply with specified performance characteristics.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Provide entrances from a manufacturer with not less than 5-years successful experience in the fabrication of similar assemblies.

B. Installer's Qualifications: Entrances shall be installed by a firm that has not less than 3-years successful experience in the installation of similar systems.

C. Design Criteria: Drawings indicate sizes, spacings and profiles of entrances. Minor deviations will be accepted in order to use standard products when, in DCAS's sole judgment, such deviations do not materially detract from the design concept or intended performances.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver entrance assemblies in the manufacturer's original protective packaging.

B. Store components in a clean dry location away from masonry or concrete. Cover components with waterproof sheeting in a manner to permit circulation of air.
   1. Stack framing components to prevent bending and avoid significant or permanent damage.

1.6 PROJECT CONDITIONS

A. Field Measurements: Check openings by field measurement before fabrication. Show measurements on final shop drawings. Coordinate fabrication with construction progress to avoid delay in the work. Where necessary, proceed with fabrication without field measurements, and coordinate fabrication tolerances to ensure proper fit.

1.7 GUARANTEE

A. The Contractor shall provide a five (5) year written guarantee, covering the Aluminum- framed Entrances and Storefronts materials and workmanship. Should any defects occur during the stated period, they shall be corrected immediately, and all damage caused by such defects shall be corrected. All corrective work shall be at the Contractor's expense.

B. The Guarantee Period shall commence upon final acceptance of the work.

C. Furnish a guarantee in the form specified in Article on Guarantees of the General Conditions governing all contracts.

D. The following types of failure will be adjudged as defective work:
   1. Abnormal deterioration, aging or weathering of the work.
   2. Water leakage under conditions equivalent to, or less severe than, those specified.
   3. Air leakage exceeding specified limits.
   4. Structural failure due to pressures and forces up to specified limits.

5. Sealant (including structural silicone) loss of adhesion, loss of cohesion, cracking or discoloration.
6. Disengagement of gaskets or weatherstrips for conditions not exceeding specified design pressure, building movement and racking test requirements.
7. Deterioration or discoloration of finish.
8. Loss of effective glass bite due to shifting of glass.
9. Loss of effective glass bearing on setting blocks due to shifting of glass or blocks.

PART 2- PRODUCTS

2.1 MANUFACTURER

A. Available Manufacturer: Subject to compliance with requirements, manufacturer's offering products which may be incorporated in the Work include the following:
   1. Kawneer Co., Inc. (specified below).
   2. Vistawall Architectural Products.
   3. Tubelite, Inc.
   4. Efco.
   5. Ellison (specified below).
   6. Or an Approved Equal.

B. Product: (Type 1) Kawneer Series wide stile aluminum and glass entrance doors, 1-3/4" thick, Or an Approved Equal.

C. Product: (Type 2) Ellison Series wide stile balanced aluminum and glass entrance doors, 1-3/4" thick, Or an Approved Equal.

D. Entrance Framing: Kawneer, extruded aluminum framing, as selected by the Resident Engineer.

E. Finish Hardware: Refer to Section 087100- Door Hardware for installation requirements.

F. Glass: Provide glass of types and thicknesses indicated. Fabricate to sizes indicated with edge clearances and tolerances that comply with manufacturer's recommendations. Refer to Section 088000 "Glass and Glazing" for requirements.

G. Sealants: Provide structural and weather-seal sealants recommended by the manufacturer of the structural sealant glazed curtain wall system.

H. Product: (Type 3) Ellison Series wide stile balanced bronze and glass entrance doors, 1- 3/4" thick, Or an Approved Equal.

2.2 MATERIALS

A. Aluminum Members: Alloy and temper recommended by the manufacturer for strength, corrosion resistance, and finish; comply with ASTM B 221 for extrusions and ASTM B 209 for sheet or plate. Minimum thickness of aluminum is 0.125".

B. Fasteners: Provide fasteners of aluminum, non-magnetic stainless steel, or other materials warranted by the manufacturer to be non-corrosive and compatible with aluminum and other

components.

1. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125” thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard non-corrosive pressed-in splined grommet nuts.
2. Exposed Fasteners: Avoid use of exposed fasteners. For the application of hardware, use fasteners that match the finish of member or hardware being fastened.
3. Type: Provide Phillips flat-head machine screws for exposed fasteners, with finish to match item fastened.

C. Concealed Flashing: Provide 26 gage minimum dead-soft stainless steel, or 0.26” minimum extruded aluminum of alloy and type selected by manufacturer for compatibility with other components.

D. Brackets and Reinforcements: Provide high-strength aluminum brackets and reinforcements; otherwise provide nonmagnetic stainless steel or hot-dip galvanized steel complying with ASTM A 123.

E. Concrete/Masonry Inserts: Provide inserts of cast-iron, malleable iron, or hot-dip galvanized steel complying with ASTM A 123.

F. Compression Weatherstripping: Replaceable compressible weatherstripping gaskets of molded neoprene or molded PVC complying with ASTM D 2287.

G. Copper Alloy, Bronze: Type and form indicated to comply with the following requirements:
1. Extruded Shapes: ASTM B 455, alloy UNS No. C38500 (extruded architectural bronze); minimum 0.125 inch (3.2 mm) thick.
2. Plate, Sheet, Strip and Flat Bars: ASTM B 36/B 36M, alloy UNS No. C28000 (muntz metal, 60 percent copper); minimum 0.062 inch (1.6 mm) thick, except minimum 0.04 inch (1 mm) thick for cladding.

2.3 COMPONENTS

A. Stile-and-Rail Type Entrance Doors: Provide tubular frame members, fabricated with mechanical joints using heavy inserted reinforcing plates and concealed tie-rods or j- bolts.
1. Glazing: Fabricate doors to facilitate replacement of glass or panels, without disassembly of stiles and rails. Provide snap-on extruded aluminum glazing stops, with exterior stops anchored for non-removal.

B. Brackets and Reinforcements: Provide manufacturer’s standard brackets and reinforcements that are compatible with adjacent materials. Provide nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer’s standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.
1. Do not use exposed fasteners, except for hardware application. For hardware application, use countersunk Phillips flat-head machine screws finished to match framing members or hardware being fastened, unless otherwise indicated.
2. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel

inserts complying with ASTM A 123 or ASTM A 153 requirements.

3. Concealed Flashing: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding flashing, compatible with adjacent materials, and of type recommended by manufacturer.
4. Weather Stripping: Manufacturer's standard replaceable weather stripping as follows:
5. Compression Weather Stripping: Molded neoprene complying with ASTM D 2000 requirements or molded PVC complying with ASTM D 2287 requirements.

D. For bronze components, use bronze fasteners, bronze exposed reinforcement and pull handles. For concealed fasteners, use non-corrosive metal.

2.4 HARDWARE

A. General: Provide heavy-duty hardware units indicated in sizes, number, and type recommended by manufacturer for entrances indicated. Finish exposed parts to match door finish, unless otherwise indicated.

B. Balanced-Door Hinge Assembly: Manufacturer's standard balanced-door mechanism with balancing guide roller and top- and bottom-sealed, self-aligning, antifriction bearings, arms, and pivots and as follows:
1. Steel Hinge Tube: Concealed in jamb.

C. Pull Handles: As selected by RE/PM from manufacturer's full range of pull handles and plates. Stainless steel unless otherwise indicated.

2.5 FABRICATION

A. General: Fabricate aluminum entrance components to designs, sizes and thicknesses indicated.
1. Thermal-Break Construction: Where required provide framing system with a concealed, low-conductance thermal barrier, located between exterior materials and interior members. Use manufacturer's standard construction that has been in use for not less than 3 years.

B. Prefabrication: Before delivery, complete fabrication, assembly, finishing, hardware application, and other work to the greatest extent possible. Disassemble components only as necessary.
1. Do not drill and tap for surface-mounted hardware items until time of installation at project site.
2. Perform cutting, fitting, forming, drilling and grinding of metal work to prevent damage to exposed finish surfaces. For hardware, perform these operations prior to application of finishes.

C. Welding: Comply with AWS recommendations; grind exposed welds flush and smooth. Restore mechanical finish.

D. Reinforcing: Install reinforcing as required for hardware and necessary for performance requirements, sag resistance and rigidity.

E. Dissimilar Metals: Separate dissimilar metals with zinc chromate primer, or other separator that

will prevent corrosion.

F. Continuity: Maintain accurate relation of planes and angles, with hairline fit of contacting members.

G. Fasteners: Conceal fasteners wherever possible.

H. Weatherstripping: For exterior doors, provide compression weatherstripping against fixed stops; at other edges, provide sliding weatherstripping retained in adjustable strip mortised into door edge.
   1. Provide EPDM or vinyl blade gasket weatherstripping in bottom door rail, adjustable for contact with threshold.

2.6 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

D. High-Performance Organic Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.
   1. Fluoropolymer 3-Coat Coating System: Manufacturer's standard 3-coat, thermocured system composed of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluorocarbon topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2.
   2. Color: Custom color as selected by Resident Engineer.

2.7 COPPER-ALLOY FINISHES

A. Finish designations prefixed by CDA comply with the system established by the Copper Development Association for designing copper-alloy finishes.

B. Statuary Conversion Coating over Satin Finish: CDA M32-C55 (Mechanical Finish: directionally textured, fine satin. Chemical Finish: conversion coating, sulfide.)
   1. Color: Match existing adjoining finishes as approved by DCAS.

PART 3- EXECUTION

3.1 EXAMINATION

A. Examine areas, 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.

3.2 PREPARATION

A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

A. Comply with manufacturer’s instructions and recommendations for installation.

B. Set units plumb, level, and true to line, without warp or rack of framing members or doors. Provide proper support and anchor securely. Separate aluminum and other metal from corrosion or electrolytic action at dissimilar materials. Do not install damaged components.

C. Drill and tap frames and doors and apply surface-mounted hardware items. Comply with hardware manufacturer’s instructions and template requirements. Use concealed fasteners wherever possible. Do not through bolt hardware unless specifically approved by DCAS.

D. Set sill members in a bed of sealant or with joint fillers or gaskets to provide weathertight construction. Comply with Section 079000.

E. Install glass and glazing in accordance with requirements of Section Glass and Glazing.

F. Repair all damaged finishes with coating systems compatible with and equal to factory applied finishes.

G. Fit joints to produce hairline joints free of burrs and distortion.

H. Rigidly secure nonmovement joints.

I. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

J. Seal perimeter and other joints watertight unless otherwise indicated.

K. Install components plumb and true in alignment with established lines and grades.

L. Install operable units’ level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

M. Install weather seal sealant according to Section 079200 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

N. Metal Protection
   1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by

painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.

2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

3.4 ERECTION TOLERANCES

A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances.
   1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
   2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
   3. Alignment:
      a. Where surfaces about in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm.
      b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
      c. c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).
      d. 4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

3.5 CLEANING

A. Clean the completed system, inside and out, promptly after installation.

B. Clean glass surfaces after installation, complying with requirements in the “Glass and Glazing” section for cleaning and maintenance. Remove excess glazing and sealant compounds, dirt and other substances.

3.6 PROTECTION

A. Provide protection to ensure that entrances will be without damage or deterioration, other than normal weathering, at time of Substantial Completion.

3.7 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

B. Provide protection to ensure that entrances will be without damage or deterioration, other than normal weathering, at time of Substantial Completion.

C. Swing entrance assemblies include all related preparation, joint sealant applications and the installation of door hardware and power door operators as indicated by the Architect and/ or as directed by DCAS, deemed included in the Unit Price.

END OF SECTION 084113

SECTION 084126
ALL-GLASS ENTRANCES AND STOREFRONTS

PART 1- GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SUMMARY

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the all-glass doors and storefronts, as shown on the drawings, and/ or specified herein, as needed for a complete and proper installation, including the following:
   1. Interior and exterior and manual-swinging all-glass entrance doors.
   2. All-glass sidelights and transoms.
   3. Interior and exterior all-glass storefronts.
   4. Clerestories
   5. Bottom and top rail as noted on drawings.
   6. Hardware including recessed floor closer, pivots and associated plates, custom stainless-steel saddle with removable section at closer, push-pull bars, etc.
   7. Electric lock and associated plates and/ or cylinder lock as indicated.
   8. Security and door hardware devices coordinated within assemblies.

1.3 RELATED SECTIONS

A. Division 08 Section "Aluminum-Framed Entrances and Storefronts" for storefront systems that incorporate all-glass entrance doors.

B. Division 08 Section "Glazing" for general glass requirements.

C. Steel and aluminum storefront- Section 084113.

D. Door hardware- Section 087100.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

C. Engineering Responsibility: Prepare data for all-glass systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.

D. Accessible All-Glass Entrance Doors: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1

E. Source Limitations: Obtain all-glass systems from single source from single manufacturer.

1.5 PERFORMANCE REQUIREMENTS

A. General Performance: Provide systems, including anchorage, capable of withstanding loads indicated without structural failure, deflection exceeding specified limit, transfer of stresses from support components to glazing, from glazing to glazing, or from glazing to support, as determined by structural analysis.

B. Delegated Design: Design all-glass systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Structural Performance: All-glass systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to SEI/ASCE 7.
   1. Wind Loads: As indicated on Drawings. (Exterior Only)
   2. Basic Wind Speed: 90 mph
   3. Seismic Loads: As indicated on Drawings. (Exterior Only)

D. Deflection Normal to glazing Plane: Limited to 1/175 of clear span or 3/4” whichever is smaller.

E. Thermal Movements: Allow for thermal movements resulting from the following ambient and surface temperature changes of 120 deg F (67 deg C).

1.6 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for all- glass system.

B. Shop Drawings; Show details of fabrication and installation, including the following:
   1. Plans, elevations, and sections.
   2. Details of fittings and glazing, including isometric drawings of patch and rail fittings.
   3. Hardware quantities, locations, mounting heights, and installation requirements.
   4. Anchorages and reinforcement.
   5. Glazing details.

C. Samples for Initial Selection: For each type of exposed finish indicated.

D. Samples for Verification: Of size indicated below and of same thickness and material indicated for Work. Show the full range of color and texture variations expected.
   1. Metal Finishes: 12-inch-long sections of patch fittings, rails, and other items. Finishes to be compatible with surrounding systems.
   2. Glass: 12 inches square showing exposed-edge finish.

E. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication, and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, sidelights, transoms, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

F. Delegated-Design Submittal: For all-glass systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

G. Closeout submittals: Operations and Maintenance data.

1.7 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify opening dimensions of all-glass entrances by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 GUARANTEE

A. Submit a written warranty executed by the manufacturer agreeing to repair or replace components of all-glass entrances that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:
   1. Structural failures including excessive deflection, air infiltration, or water leakage.
   2. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   3. Failure of operating components to function normally.

B. Warranty Period: 5 years from date of final acceptance of the Work.

PART 2- PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. ACI Distribution; a division of Vitro America, Inc.
   2. Alpha Door & Rail, Inc.
   3. Arch Aluminum & Glass Co., Inc.
   4. Blumcraft of Pittsburgh.
   5. Oldcastle Glass, Inc.
   6. Virginia Glass Products Corporation; a subsidiary of Virginia Mirror Company.
   7. Vistawall Architectural Products; The Vistawall Group.
   8. Kawneer.
   9. Or an Approved Equal.

2.2 MATERIALS

A. Clear Glass: ASTM C 1048, Kind FT (fully tempered), and laminated (complying with ASTM C1172) extra low iron, Condition A (uncoated surfaces), Type I (transparent), Class 1 (clear) requirements. Provide products of thickness indicated that have been tested for surface and edge compression according to ASTM C 1048 and for impact strength according to CPSC 16 CFR, Part 1201 for Category II materials. See Section 084126 for additional glass requirements.
   1. Class 1: Clear monolithic.
      a. Thickness: 1/2 inch (13 mm)
      b. Locations: As indicated.
   2. Class 2: Tinted monolithic.
      a. Color: As per DCAS
      b. Thickness: 3/8 inch (10 mm) or 1/2 inch (13 mm).
      c. Locations: As indicated.

B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), with strength and durability characteristics of not less than Alloy 6063-T5.
   1. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
   2. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
      a. Color: As selected by Architect from full range of industry colors and color densities.

C. Stainless-Steel: ASTM A 666, Type 316; No. 4 finish.

2.3 COMPONENTS

A. Fittings: Provide fittings and accessories for all-glass entrances of configurations shown on drawings fabricated of aluminum (stainless steel, minimum 12 ga).

B. Fitting Configuration: Provide manual-swinging, all-glass, entrance doors, sidelights and transoms with continuous rail fitting at top and bottom.

C. Patch and Rail Fittings: Aluminum (stainless steel).

D. Accessory Fittings: Match patch- and rail-fitting metal and finish for the following:

E. Overhead doorstop.
   1. Center-housing lock.
   2. Glass-support-fin brackets.

F. Anchors and Fastenings: Concealed.

G. Weather Stripping: Pile type; replaceable without removing all-glass entrance doors from pivots. Manufacturer's standard sweep-type weather stripping.

2.4 HARDWARE

A. General: Heavy-duty hardware units indicated in sizes, numbers, and type recommended by manufacturer for all-glass entrances indicated. For exposed parts, match fitting metal and finish.

B. Closers: Center-hung, concealed floor closers complying with ANSI/BHMA A156.4, Grade 1 or

Grade 2 requirements, including cases, bottom arms, top pivots, plates and accessories required for a complete installation, and as follows:

1. Swing: Single acting.
2. Hold Open: Selective.
3. Positive Dead Stop: Coordinated with hold-open angle.
4. Delayed-Action Closing: Comply with requirements of authorities having jurisdiction of the Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," whichever are more stringent.
    a. Opening Force: 5 lbf. Weight to be compatible with door weight for compliance.

C. Push-Pull: Custom Stainless steel by d-line, as shown on drawings.

D. Panic hardware as indicated on drawings.

E. Lockset: Bottom rail dead bolt, dead bolt operated by key outside and inside engaging cutout in threshold or floor plate.
    1. Lock cylinder furnished by Section 087100.

F. Make provisions for and coordinate with installation requirements for electro/magnetic lock and door release at door head as specified in Section 087100.

G. Threshold: Manufacturer's standard threshold with cutouts coordinated for operating hardware, with anchors and jamb clips. not more than 1/2 inch high with beveled edges providing a floor- level change with a slope of not more than 1:2 and fabricated of stainless steel.

2.5 FABRICATION

A. General: Shop fabricate all-glass entrance components in sizes, profiles, and configurations indicated.
    1. Provide holes and cutouts in glass to receive hardware, fittings, rails, and accessories before tempering glass. Do not cut, drill, or make other alterations to glass after tempering.
    2. Fully temper glass using horizontal roller hearth process.
    3. Factory assemble components and factory install hardware to greatest extent possible.

PART 3- EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where all glass doors are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Install all-glass entrances and associated components according to manufacturer's written instructions, coordinate installation with structural glass wall fabricator.

B. Set units level and plumb.

C. Maintain uniform clearances between adjacent components.
D. Lubricate hardware and other moving parts according to manufacturer's written instructions.

E. Set, seal, and grout floor closer cases as required by hardware and substrate.

3.3 ADJUSTING AND CLEANING

A. Adjust doors and hardware to provide tight fit at contact points and weather stripping, smooth operation, and weathertight closure.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer that ensure all-glass entrances are without damage or deterioration.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. After completion of all-glass storefront installation and nominal curing of sealant and glazing compounds, but before installation of interior finishes, test for water leaks according to AAMA 501.2.

C. Perform test for total areas as designated by Architect.

D. Work will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

END OF SECTION 084126

SECTION 087100
DOOR HARDWARE

PART 1 – GENERAL

1.1 SUMMARY

A. Work Included: Provide finish hardware in accordance with the Contract Documents. The Work of this Section shall include the furnishing and installation of all finish hardware in relation to all interior doors (and exterior doors as directed). The Work of this Section shall also include but not be limited to the following:
   1. Hinges.
   2. Spring hinges.
   3. Key control system.
   4. Lock cylinders and keys.
   5. Lock and latch sets.
   6. Bolts.
   7. Exit devices.
   8. Push/pull units.
   9. Closers.
   10. Overhead holders.
   11. Miscellaneous door control devices.
   12. Door trim units.
   13. Protection plates.
   14. Sound stripping for interior doors.
   15. Automatic drop seals (door bottoms).
   16. Astragals or meeting seals on pairs of doors.
   17. Doorstops.
   18. Security hardware.
   19. Door Bolt Occupancy for Lactation Rooms.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 8 Section- “Hollow Metal Doors and Frames”.
   2. Division 8 Section – “Flush Wood Doors”.
   3. Division 8 Section – “Aluminum Framed Entrances and Storefronts”.
   4. Division 8 Section – “Automatic Door Operators”.

1.2 REFERENCES

A. STANDARDS
   1. ANSI A156.1 – Butts and Hinges
   2. ANSI A156.3 – Exit Devices
   3. ANSI A156.4 – Door Controls – Door Closers
   4. ANSI A156.5 – Auxiliary Locks and Associated Products
   5. ANSI A156.6 – Architectural Door Trim.
   6. ANSI A156.7 – Template Hinge Dimensions

7. ANSI A156.8 – Door Controls – Overhead Holders
8. ANSI A156.13 – Mortise Locks and Latches
9. ANSI A156.15 – Closer Holder Release Devices
10. ANSI A156.16 – Auxiliary Hardware
11. ANSI A156.18 – Material and Finishes
12. NFPA80 – Fire Doors and Windows
13. UL10C – Positive Pressure Fire Tests of Door Assemblies.

1.3 CODES

A. NFPA 101 – Life Safety Code

1.4 SUBMITTALS

A. Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

B. Schedules to be in vertical format, listing each door opening, and organized into "hardware sets" indicating complete designations of every item required for each door opening to function as intended. Hardware schedule shall be submitted within two (2) weeks from date the purchase order is received by the finish hardware supplier. Furnish four (4) copies of revised schedules after approval for field and file use. Note any special mounting instructions or requirements with the hardware schedule.

C. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, finish of door hardware and ADA requirements and compliance.

D. Solid core doors with wood veneer faces.
   1. Shop priming of flush wood doors.
   2. Factory finishing of flush wood doors.
   3. Factory fitting flush wood doors to frames and factory machining for hardware.
   4. Louvers for flush wood doors.
      a. Type, style, function, size, and finish of each hardware item.
      b. Name and manufacturer of each item.
      c. Fastenings and other pertinent information.
      d. Location of each hardware set cross referenced to indications on Drawings both on floor plans and in door and frame schedule.
      e. Explanation of all abbreviations, symbols, and codes contained in schedule.
      f. Mounting locations for hardware.
      g. Door and frame sizes and materials.
      h. Keying information.
      i. Handing and degree of swing of each door.
      j. Elevation drawings and operational descriptions for all electronic opening.
   5. Submittal Sequence: Submit schedule along with essential product data in order to facilitate the fabrication of other work that is critical in the Project construction schedule.

6. Keying Schedule: Coordinate keying requirements with DCAS for each site. Submit separate detailed schedule indicating clearly how the keying of locks has been fulfilled.

E. Samples of each type of exposed hardware unit in finish indicated and tagged with full description for coordination with schedule. Submit samples prior to final submission of hardware schedule.
1. Samples will be returned to the supplier. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated in the Work, within limitations of keying coordination requirements.

F. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
1. Furnish a complete list and suitable templates, together with finish hardware schedule to contractor, for distribution to necessary trades supplying materials to be prepped for finish hardware.

G. Submit copies of finish hardware schedule in accordance with Division 1, General Requirements. Provide items, articles, materials, operations and methods listed, mentioned or scheduled herein or on drawings, in quantities as required to complete project. Provide hardware that functions properly. Prior to furnishing hardware, advise Architect of items that will not operate properly, are improper for conditions, or will not remain permanently anchored.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.

B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced architectural hardware consultant (AHC) who is available to DCAS and the Contractor, at reasonable times during the course of the Work, for consultation.
1. Require supplier to meet with Owner to finalize keying requirements and to obtain final instructions in writing.

C. Fire-Rated Openings: Provide door hardware for fire-rated openings where directed by the Architect that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by UL, Warnock Hersey, Factory Mutual Research Corporation, or other testing and inspecting organization acceptable to authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.
1. Project requires door assemblies and components that are compliant with positive pressure and S-label requirements. Specifications must be cross-referenced and coordinated with door manufacturers to ensure that total opening engineering is compatible with UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and UBC 7-2, Fire Tests of Door Assemblies.
a. Certification(s) of compliance shall be made available upon request by the Authority Having Jurisdiction.

D. Comply with applicable requirements of the ADA and the New York City Building Code requirements for accessibility.

1.6 ELECTRONIC HARDWARE SYSTEMS

A. Provide complete wiring diagrams prepared by an authorized factory employee for each opening requiring electronic hardware, except openings where only magnetic hold-open devices are specified. Provide a copy with each hardware schedule submitted after approval.

B. Provide complete operational descriptions of electronic components listed by opening in the hardware submittals. Operational descriptions to detail how each electrical component functions within the opening incorporating all conditions of ingress and egress. Provide a copy with each hardware schedule submitted for approval.

C. Provide elevation drawings of electronic hardware and systems identifying locations of the system components with respect to their placement in the door opening. Provide a copy with each hardware schedule submitted for approval.

D. Prior to installation of electronic hardware, arrange conference between supplier, installers and related trades to review materials, procedures and coordinating related work.

E. The electrical products contained within this specification represent a complete engineered system. If alternate electrical products are submitted, it is the responsibility of the distributor to bear the cost of providing a complete and working system including re-engineering of electrical diagrams and system layout, as well as power supplies, power transfers and all required electrical components. Coordinate with electrical engineer and electrician to ensure that line voltage and low voltage wiring is coordinated to provide a complete and working system.

F. For each item of electrified hardware specified, provide plug in standardized connectors to accommodate up to twelve (12) wires. Plug connectors shall plug directly into through-door wiring harnesses, frame wiring harnesses, electric locking devices and power supplies.

1.7 OPERATIONS AND MAINTENANCE MANUALS

A. Upon completion of construction and building turnover, furnish two (2) complete maintenance manuals to the owner. Manuals to include the following items.
   1. Approved hardware schedule, catalog cuts and keying schedule.
   2. Hardware installation and adjustment instructions.
   3. Manufacturer’s written warranty information.
   4. Wiring diagrams, elevation drawings and operational descriptions for all electronic openings.

1.8 SUPPLIER QUALIFICATIONS

A. A recognized architectural door hardware supplier who has maintained an office and has been furnishing hardware in the project’s vicinity for a period of at least two (2) years.

B. Hardware supplier shall have office and warehouse facilities to accommodate this project.

C. Hardware supplier shall have in his employment at least one (1) Architectural Hardware Consultant (AHC) who is available at reasonable times during business hours for consultation about the project's hardware and requirements to the owner, architect and contractor.

D. Hardware supplier must be an authorized factory distributor of all products specified herein.

1.9 AUTOMATIC OPERATOR SUPPLIER QUALIFICATIONS

A. Power Operator products shall be furnished a factory trained, certified and direct purchaser of the automatic operator. Supplier to be a current member of the Power Operator preferred installation program and be equipped with servicing the equipment.

1.10 PRODUCT HANDLING

A. Properly package and mark items according to the approved hardware schedule, complete with necessary screws and accessories, instructions, and installation templates for spotting mortising tools. Contractor shall check deliveries against accepted list and provide receipt for them, after which he is responsible for storage and care. Any shortage or damaged good shall be made without cost to the owner.

B. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.

C. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

D. The supplier shall deliver all hardware to the project site; direct factory shipments are not allowed unless agreed upon beforehand. Hardware supplier shall coordinate delivery times and schedules with the contractor. Inventory door hardware jointly with representatives of hardware supplier and hardware installer/contractor until each is satisfied that count is correct.

E. No keys, other than construction master keys and/ or temporary keys are to be packed in boxes with the locks.
   1. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of work will not be delayed by hardware losses both before and after installation.

1.11 WARRANTY

A. All items, except as noted below, shall be warranted in writing by the manufacturer against failure due to defective materials and workmanship for a minimum period of one (1) year commencing on the date of final completion and acceptance. In the event of product failure, promptly repair or replace item with no additional cost to the owner.

1. Mortise Locksets: Five (5) years.
2. Exit Devices: Five (5) years.
3. Door Closers: Ten (10) years.
4. Electromagnetic Locks: Two (2) years.

1.12 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for the DCAS' continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2- PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
   1. Butt Hinges:
      a. Bommer Industries, Inc.
      b. Hager Hinge Co.
      c. Stanley Hardware, Div. Stanley Works.
      d. Schlage.
      e. Or an Approved Equal.
   2. Key Control System:
      a. Key Control Systems, Inc.
      b. Telkee Inc.
      c. Or an Approved Equal.
   3. Cylinders and Locks:
      a. Best access systems; Div. of Stanley Security Solutions Inc.
      b. Schlage Lock, Div. Ingersoll-Rand Door Hardware Group.
      c. Yale Security Inc.
      d. Or an Approved Equal.
   4. Bolts:
      a. Hager Hinge Co.
      b. H. B. Ives, A Harrow Company.
      c. Stanley Hardware, Div. Stanley Works.
      d. Schlage.
      e. Or an Approved Equal.
   5. Exit/Panic Devices:
      a. Precision Hardware, Inc.
      b. Von Duprin, Div. Ingersoll-Rand Door Hardware Group.
      c. Yale Security Inc.
      d. Or an Approved Equal.
   6. Push/Pull Units:
      a. Baldwin Hardware Corp.
      b. Hager Hinge Co.
      c. H. B. Ives, A Harrow Company.
      d. CR Lawrence
      e. Schlage

f. Or an Approved Equal.

7. Overhead Closers:
   a. LCN, Div. Ingersoll-Rand Door Hardware Group.
   b. Rixson-Firemark, Div. Yale Security Inc.
   c. Yale Security Inc.
   d. Or an Approved Equal.
8. Floor Closers:
   a. Rixson-Firemark, Div. Yale Security Inc.
   b. Dorma.
   c. Or an Approved Equal.
9. Door Control Devices:
   a. Baldwin Hardware Corp.
   b. Hager Hinge Co.
   c. H. B. Ives, A Harrow Company.
   d. Von Duprin.
   e. Or an Approved Equal.
10. Door Trim Units:
   a. Baldwin Hardware Corp.
   b. Hager Hinge Co.
   c. H. B. Ives, A Harrow Company.
   d. Or an Approved Equal.
11. Kick, Mop, and Armor Plates:
   a. Baldwin Hardware Corp.
   b. Hager Hinge Co.
   c. H. B. Ives, A Harrow Company.
   d. Granger.
   e. Or an Approved Equal.
12. Security Hardware:
   a. Folger Adams.
   b. Von Duprin
   c. Southern Steel
   d. Or an Approved Equal.
13. Cypher Locks
   a. KABA Simplex L1000 Series.
   b. KABA E-Plex 2000 Series.
   c. Or an Approved Equal.
14. Door Stripping and Seals:
   a. Hager Hinge Co.
   b. National Guard Products, Inc.
   c. Pemko Manufacturing Co., Inc.
   d. Or an Approved Equal.
15. Thresholds:
   a. Hager Hinge Co.
   b. National Guard Products, Inc.
   c. Pemko Manufacturing Co., Inc.
   d. Or an Approved Equal.
16. Automatic Drop Seals:
   a. Hager Hinge Co.

b. National Guard Products, Inc.
c. Pemko Manufacturing Co., Inc.
d. Or an Approved Equal.

17. Sound Stripping:
    a. National Guard Products, Inc.
    b. Pemko Manufacturing Co., Inc.
    c. Reese Enterprises, Inc.
    d. Or an Approved Equal.
18. Doorstops
    a. Baldwin.
    b. Everbilt.
    c. Prime-Line.
    d. Or an Approved Equal.
19. Silencers
    a. Ives.
    b. Rockwood.
    c. Hager.
    d. Or an Approved Equal.
20. Occupancy Indicator
    a. Schlage.
    b. Yale.
    c. Arrow.
    d. Or an Approved Equal.
21. Astragals:
    a. Hager Hinge Co.
    b. National Guard Products, Inc.
    c. Pemko Manufacturing Co., Inc.
    d. Or an Approved Equal.

2.2 SCHEDULED HARDWARE

A. Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of finish hardware are indicated in the "Hardware Schedule" at the end of this Section. Products are identified by using hardware designation numbers of the following:
   1. Manufacturer's Product Designations: The product designation and name of one manufacturer are listed for each hardware type required for the purpose of establishing minimum requirements. Provide either the product designated or, where more than one manufacturer is specified under the Article "Manufacturers" in Part 2 for each hardware type, the comparable product of one of the other manufacturers that complies with requirements, or an Approved Equal.
   2. ANSI/BHMA designations used elsewhere in this Section or in schedules to describe hardware items or to define quality or function are derived from the following standards. Provide products complying with these standards and requirements specified elsewhere in this Section.
      a. Butt Hinges: ANSI/BHMA A156.1.
      b. Bored and Preassembled Locks and Latches: ANSI/BHMA A156.2.
      c. Exit Devices: ANSI/BHMA A156.3.
      d. Door Controls- Closers: ANSI/BHMA A156.4.
      e. Auxiliary Locks and Associated Products: ANSI/BHMA A156.5.
      f. Architectural Door Trim: ANSI/BHMA A156.6.

g. Template Hinge Dimensions: ANSI/BHMA A156.7.
h. Door Controls- Overhead Holders: ANSI/BHMA A156.8.
i. Mortise Locks and Latches: ANSI/BHMA A156.13.
j. Closer Holder Release Devices: ANSI/BHMA A156.15.
k. Auxiliary Hardware: ANSI/BHMA A156.16.
l. Self-Closing Hinges and Pivots: ANSI/BHMA A156.17.
m. Materials and Finishes: ANSI/BHMA A156.18.

2.3 MATERIALS AND FABRICATION

A. Manufacturer's Name Plate: All hardware shall be stamped with the name of the manufacturer and installed so that the manufacturer's name is visible.
1. Manufacturer's identification will be permitted on rim of lock cylinders only.

B. Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI/BHMA A156 series standards for each type of hardware item and with ANSI/BHMA A156.18 for finish selected. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

C. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.

D. Furnish screws for installation with each hardware item. Provide Phillips flathead screws, or an Approved Equal, as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.

E. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners. Do not use thru bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely and is approved by DCAS. Where thru-bolts are used as a means of reinforcing the work, provide sleeves for each thru-bolt or use sex screw fasteners.

F. Where the finished shape or size of existing members receiving finish hardware are such as to render unsuitable or prevent the use of the specific types or sizes of hardware, suitable types or sizes shall be furnished upon approval of the Architect and DCAS, having as meanly as practicable the same function, operation, and quality as the specified finish hardware.

2.4 HINGES, BUTTS, AND PIVOTS

A. Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

B. Screws: Provide Phillips flat-head screws complying with the following requirements:

1. For metal doors and frames install machine screws into drilled and tapped holes.
2. For wood doors and frames install wood screws.
3. For fire-rated wood doors install #12 x 1-1/4-inch, threaded-to-the-head steel wood screws.
4. Finish screw heads to match surface of hinges or pivots.

C. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
1. Out-Swing Corridor Doors with Locks: Non-removable pins.
   a. Interior Doors: Non-rising pins.
   b. Tips: Flat button and matching plug, finished to match leaves, except where hospital tip (HT) indicated.

D. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges per door leaf for doors 90 inches or less in height and one additional hinge for each 30 inches of additional height.
1. Fire-Rated Doors: Not less than 3 hinges per door leaf for doors 86 inches or less in height with same rule for additional hinges.

E. Hinge sizes shall be detailed so that the least amount of projection shall be visible from the frame.

F. Unless otherwise noted, butt hinges shall be full mortise, five knuckle ball or oil impregnated bearings with flat button tip.

2.5 LOCK CYLINDERS AND KEYING

A. Existing System: Grandmaster key the locks to the DCAS' existing system, with a new master key for the Project.

B. Review the keying system with the DCAS and provide the type required (master, grandmaster, or great grandmaster), either new or integrated with the DCAS' existing system.

C. Equip locks with manufacturer's standard 6-pin tumbler cylinders.

D. Equip locks with manufacturer's special 6-pin tumbler cylinder with construction master key feature that permits voiding of construction keys without cylinder removal.

E. Where applicable to existing keying a specific site, equip locks with cylinders for interchangeable-core pin tumbler inserts. Furnish only temporary inserts for the construction period and remove these when directed.
1. Furnish final cores and keys for installation by DCAS.

F. Metals: Construct lock cylinder parts from brass or bronze, stainless steel, or nickel silver.

G. Comply with DCAS instructions for master keying and, except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks.
1. Permanently inscribe each key with number of locks that identifies cylinder manufacturer's key symbol, and notation, "DO NOT DUPLICATE."

H. Key Material: Provide keys of nickel silver only.

I. Key Quantity: Furnish 3 change keys for each lock, 5 master keys for each master system, and 5 grandmaster keys for each grandmaster system.
   1. Furnish one extra blank for each lock.
   2. Deliver keys to Project Manager.

J. Bitting Schedule: Provide bitting schedule for DCAS locksmith.

2.6 KEY CONTROL SYSTEM

A. Where an existing key control system exists at a site provide required envelopes, labels, tags with self-locking key clips, receipt forms, or other required items to coordinate with key control system.

2.7 LOCKS, LATCHES, AND BOLTS

A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set, unless otherwise indicated.
   1. Provide flat lip strikes for locks with 3-piece, antifriction latch bolts as recommended by manufacturer.
   2. Provide extra-long strike lips for locks used on frames with applied wood casing trim.
   3. Provide recess type top strikes for bolts locking into head frames, unless otherwise indicated.
      a. Provide dust-proof strikes for foot bolts, except where special threshold construction provides non-recessed strike for bolt.
      b. Provide roller type strikes where recommended by manufacturer of the latch and lock units.

B. Lock Throw: Provide 5/8-inch minimum throw of latch on pairs of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.

C. Flush Bolt Heads: Minimum of 1/2-inch- diameter rods of brass, bronze, or stainless steel with minimum 12-inch- long rod for doors up to 84 inches in height. Provide longer rods as necessary for doors exceeding 84 inches in height.

D. Equip all locks with ADA approved lever design, consistent with adjoining hardware.

2.8 PUSH/PULL UNITS

A. Concealed Fasteners: Provide manufacturer's special concealed fastener system for installation, thru bolted for matched pairs but not for single units.

2.9 CLOSERS AND DOOR CONTROL DEVICES

A. Closer: Heavy-duty, cast-iron cylinder, UL listed for use on fire-rated doors, all weather hydraulic fluid, ADA compliant, interior or exterior application, surface mounted closer with "hold-open" arm and 10-year warranty.
   1. Manufacturer: 4000 Series- Model No. 4010: Hinge (pull side) mounted or Model No. 4020: Top jamb (push side) mounted by LCN Division, Ingersoll-Rand Company; Or an Approved Equal.

2. Finish: LCN Aluminum- AL (BHMA 689) or as specified by Architect.
3. Access-Free Manual Closers: Where manual closers are indicated provide adjustable units complying with ANSI A117.1 provisions for door opening force and delayed action closing.

B. Combination Door Closers and Holders: Provide units designed to hold door in open position under normal usage and to release and close door automatically under fire conditions. Incorporate an integral electromagnetic holder mechanism designed for use with UL listed fire detectors, provided with normally closed switching contacts.
1. Provide integral smoke detector device in combination door closers and holders complying with UL 228.

C. Door Control Devices: Provide black resilient parts for exposed bumpers.

2.10 DOOR TRIM UNITS

A. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units consisting of either machine screws or self-tapping screws.

B. Fabricate edge trim of stainless steel to fit door thickness in standard lengths or to match height of protection plates.

C. Fabricate protection plates not more than 1-1/2 inches less than door width on hinge side and not more than 1/2 inch less than door width on pull side by height indicated.
1. Metal Plates: Stainless steel, 0.050 inch (U.S. 18 gage).
2. Metal Plates: Brass or bronze, 0.062 inch (U.S. 16 gage).

2.11 SEALS

A. General: Provide continuous sound seals on interior doors where indicated or scheduled.

B. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stocks maintained by manufacturer.

2.12 SADDLE THRESHOLDS

A. The Contractor shall provide saddle threshold for each door as directed by the Architect or DCAS. Type, style and material of saddle thresholds shall be specified by the Architect. Materials include, but not limited to bronze and aluminum.

B. Door saddle thresholds shall meet the requirements of the conditions of wall thickness, height, and ADA compliance for wheelchair accessibility.

C. Thresholds shall provide for a smooth transition between materials on both sides of the door opening and shall be of uniform quality, free of defects and anchored with appropriate anchoring materials to the flooring substrate. Use screws, fasteners, adhesives, or other means as recommended by the threshold manufacturer or Architect.

D. Saddle thresholds shall exceed the finished thickness of the adjacent wall by 1/2” on both sides.

2.13 HARDWARE FINISHES

A. Match items to the manufacturer’s standard color and texture finish for the latch and lock sets (or push-pull units if no latch or lock sets).

B. Provide finishes that match those established by BHMA or, if none established, match DCAS’s sample.

C. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer’s standards, but in no caseless than specified by referenced standards for the applicable units of hardware.

D. Provide protective lacquer coating on all exposed hardware finishes of brass, bronze, and aluminum, except as otherwise indicated. The suffix “-NL” is used with standard finish designations to indicate “no lacquer.”

E. The designations used in schedules and elsewhere to indicate hardware finishes are the industry-recognized standard commercial finishes, except as otherwise noted.

F. The submittal requirements of this Section shall apply.

2.14 FINISHES

A. Finishes Specified: Unless otherwise specified use the following finishes:
1. Exterior Hinges and wet rooms. US32D (630)
2. Interior Hinges (H.M.) US26D (626)
3. Interior Hinges (WD) US26D (626)
4. Locks and Latches US32D (630)
5. Exit Devices US32D (630)
6. Door Closers EN
7. Push-Pull-Kick Plates US32D (630)
8. Stops and Holders US26D (626)
9. Miscellaneous US26D (626)

2.15 MISCELLANEOUS

A. Escutcheons: All locksets shall be provided with standard escutcheons with finish as specified by the Architect.

B. Lever Handles: All locksets shall include ADA compliant lever handles with finish as specified by the Architect.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Contractor shall ensure that the building is secured and free from weather elements prior to installing interior door hardware. Examine hardware before installation to ensure it is free of defects.

3.2 INSTALLATION

A. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by DCAS.
   1. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
   2. NWWDA Industry Standard I.S.1.7, "Hardware Locations for Wood Flush Doors."
   3. Applicable requirements of the ADA for accessibility.

B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.

C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

E. Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

F. Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

G. All Power Operator products shall be installed by a factory trained, certified and direct purchaser of the automatic operator by the specified manufacturer. The installer is a current member of the manufacturer's preferred installation program and has a service center for stocking of parts and equipped to handle service calls.

H. All access control products shall be installed by a factory trained and certified installer.

3.3 FIELD QUALITY CONTROL

A. Provide the services of an Architectural Hardware Consultant duly certified by the Door and Hardware Industry prior to building completion to ensure that all hardware was correctly installed and is in proper working order.

3.4 ADJUSTING, CLEANING, AND DEMONSTRATING

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.
   1. During the week prior to acceptance or occupancy and make final check and adjustment of all hardware items. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

B. Clean adjacent surfaces soiled by hardware installation.

C. Instruct DCAS's personnel in the proper adjustment and maintenance of door hardware and hardware finishes.

D. Six-Month Adjustment: Approximately six months after the date of Substantial Completion, the Installer, accompanied by representatives of the manufacturers of latchsets and locksets and of door control devices, and of other major hardware suppliers, shall return to the Project to perform the following work:
   1. Examine and re-adjust each item of door hardware as necessary to restore function of doors and hardware to comply with specified requirements.
   2. Consult with and instruct DCAS's personnel in recommended additions to the maintenance procedures.
   3. Replace hardware items that have deteriorated or failed due to faulty design, materials, or installation of hardware units.
   4. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.5 HARDWARE SCHEDULE

A. General: Provide hardware for each door to comply with requirements of Section "Door Hardware," hardware set numbers indicated in door schedule, and in the following schedule of hardware sets.
   1. Hardware sets indicate quantity, item, manufacturer and product designation, size, and finish or color, as applicable; or an Approved Equal.
   2. Lockset Designs: Provide lockset designs matching design present in the existing facility.

B. Set No. 1- Cylindrical Deadbolt Set
   - 3 Hinges
   - 1 Lockset (function as required)- Grade 1, Heavy Duty, Double Cylinder
   - 1 Floor stop

C. Set No. 2- Mortise Set
   - 3 Hinges
   - 1 Lockset (function as required)- Operational Grade 1, Security Grade 1
   - 1 Floor stop

D. Set No. 3- Panic Set

- 3 Hinges
- 1 Exit Device (function as required)
- 1 Floor stop

E. Set No. 4- Security Set
- 3 Hinges FA 4-1/2 FM-ICS
- 1 Deadlock FA 86-6
- 1 Mortise Keeper w/switch FA 80-4BL
- 1 Lock Mount FA HM
- 1 Door Position Switch FA 523
- 1 Cylinder Shield FA 2CS
- 2 Pulls (outside & inside) FA 4
- 1 Over Head Closer LCN 2215
- 1 Wall or Floor Stop Ferrum

F. Set No. 5- Typical Office Set
- Lockset Heavy Duty Commercial, "Vandlgard" Keyed Lever Locks with "Athens" lever hande by Schlage.
- Hinges # FBB179, 4-1/2 x 4-1/2 Full Mortise by Stanley.
- Doorstop # 436B10 or # 438B10 by Ives.
- Door Silencer # 20 Frame Cut by Ives, (3) Rubber Door Silencers Per Door.
- Or an Approved Equal

3.7 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

B. All finish hardware not specified as a hardware set or indicated as a unit price line item will be furnished and installed as directed by the Architect or DCAS.
1. The cost for finish hardware not listed above shall be paid under the "Additional Materials" provision of the Contract.
2. There shall be no additional labor charge for the installation of finish hardware paid for under the "Additional Materials". All labor costs associated with the installation of additional finish hardware requirements shall be deemed included in the material cost.

END OF SECTION 087100

SECTION 087113
AUTOMATIC DOOR OPERATORS

PART 1 – GENERAL

1.1 SUMMARY

A. Work Included: Provide power door operators in accordance with the Contract Documents. The Work of this Section shall include but not be limited to the following:
   1. Automatic Swinging Door Systems as required by Drawings also included will be fire rated Swing Doors with necessary connecting hardware.
   2. Surface-mounted overhead, low power units for one-way swing doors.
   3. In-floor mounted, low power units for one-way swing doors.

B. Related Sections:
   1. Division 8 Section: “Aluminum-Framed Entrances and Storefronts”.
   2. Division 8 Section: “Door Hardware”.

1.2 DEFINITIONS

A. AAADM: American Association of Automatic Door Manufacturers.

B. Activation Device: A control that, when actuated, sends an electrical signal to the door operator to open the door.

C. Double-Egress (Doors): A pair of doors that simultaneously swing with the two doors moving in opposite directions with no mullion between them.

D. Double-Swing (Doors): A pair of doors that swing with the two doors moving in opposite directions with a mullion between them; each door functioning as a single-swing door.

E. Safety Device: A control that, to avoid injury, prevents a door from opening or closing.

1.3 COORDINATION

A. Coordinate sizes and locations of recesses in concrete floors for recessed control mats that control automatic door operators. Concrete, reinforcement, and formwork requirements are specified elsewhere.

B. Templates: Distribute for doors, frames, and other work specified to be factory prepared and reinforced for installing automatic door operators.

C. Coordinate hardware for doors with operators to ensure proper size, thickness, hand, function, and finish.

D. Electrical System Roughing-in: Coordinate layout and installation of automatic door operators with connections to power supplies [and access-control system].

E. Pneumatic System Roughing-in: Coordinate layout and installation of automatic door operators and power units with compressed-air piping.

1.4 SUBMITTALS

A. Product data for each door operator type required, including the manufacturer's standard details and fabrication methods and general published recommendations for each component of the door operating systems required, and the following:

B. Roughing-in diagrams.
1. Certified performance reports.
2. Installation instructions.
3. Parts lists.

C. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for automatic door operators.

D. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

E. Wiring diagrams detailing wiring for power operator, signal, and control systems.

F. Clearly differentiate between manufacturer-installed wiring and field-installed wiring. Include wiring diagrams for fire-rated openings.

G. Shop Drawings: For automatic door operators.
1. Include plans, elevations, sections, hardware mounting heights, and attachment details.
2. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Indicate locations of activation and safety devices.

H. Include diagrams for power, signal, and control wiring.

I. Maintenance Data: Submit manufacturer's maintenance and service data for door operators and control system including the name, address, and telephone number of the nearest authorized service representative.

1.5 QUALITY ASSURANCE

A. Engage an experienced Installer who is an authorized representative of the manufacturer for the installation and maintenance of the type of units required for this Project.

B. Fire-Rated and Emergency Exit Openings: Provide door operators that comply with NFPA 80 requirements for doors as emergency exits, and do not interfere with fire ratings.

C. BHMA Standard: Provide power door operators that comply with applicable requirements of ANSI A156.19 (BHMA 1601), Low Power Operated Pedestrian Door Standard.

D. UL Standard: Provide power door operators that comply with UL 325.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Surface-Mounted Overhead Units: Provide low power electro-mechanical-operated swinging units as manufactured by DOR-O-MATIC as specified here in, Or an Approved Equal, manufactured by Besam Automatic Door Operators.

B. In-Floor Mounted Units: Provide in-floor units as manufactured by Saino Manufacturing, as specified herein, Or Approved Equal.

2.2 GENERAL DOOR OPERATOR REQUIREMENTS

A. Capacity: Provide operators of the size recommended by the manufacturer for the door size, weight, and movement, for condition of exposure, and for long-term, maintenance-free operation under normal traffic load for the type of occupancy indicated.

B. Hinge Operation: For swing type doors, refer to Division 8 Section “Door Hardware” to determine type of hinge action to be matched by the door operator action.

C. Exposed Housing: Minimum 0.062-inch-thick extruded or formed aluminum cover with provisions for maintenance access. Provide fasteners that are concealed when door is in the closed position. Finish as selected by DCAS.

D. Adjustment Features: Operators shall be fully adjustable. Provide adjustment for opening, closing, and checking speeds, as well as length of time the door remains open.

2.3 SWINGING DOOR OPERATORS

A. Electro-Mechanical Operator for Swinging Doors. Provide the manufacturer’s door operators with power-opened and spring-closed, with the closing speed controlled mechanically by gear train and dynamically by braking action of electric motor and, with easy manual operation including spring closing with power off. Provide operator action as indicated and mounting as indicated below:
   1. Operator Mounting Type:
      a. Surface-mounted overhead operator.
      b. In-floor mounted operator.
   2. Power-Assisted Closing: Provide low power-assisted spring closing for overcoming wind and static pressures.
   3. Fire Door Accessories: Provide fire door accessory package consisting of UL-listed Electric solenoid latches. If required provide power reset box, and caution labels for fire-resistance rated doors indicated for electro-mechanical operation. For center-pivoted doors provide emergency release for reverse swing action of doors which are indicated or required to function as exits.

2.4 OPERATOR CONTROL SYSTEMS

A. Controls:
   1. Open control: #1291-900 Push plate , push to open, quantity: 2 min. per operator
   2. Hold control: #DK-12 Safety Presence Sensor with L021 Lockout Relay.

B. Exit Hardware for rated doors:
   1. Panic Bars #8847F Concealed.

C. Provide equivalent operator control systems as recommended by Saino Manufacturing for the in-floor mounted operator.

D. Coordinate with Electrical Contract for related preparation and install all necessary accessories, push plates, sensors, lock out relays and hardware for a complete and operational system as indicated on the drawings by the Architect, all deemed included in the Unit Price.

PART 3 – EXECUTION

3.1 PREPARATION

A. Templates and Diagrams: Furnish templates, diagrams, and other data to fabricators and installers of related work, as necessary, for coordination of the power door operator installation.

3.2 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, door and frame preparation and reinforcements, and other conditions affecting performance of automatic door operators.

B. Examine roughing-in for electrical systems to verify actual locations of power connections before automatic door operator installation.

C. Examine roughing-in for compressed-air piping systems to verify actual locations of piping connections before automatic door operator installation.

D. Verify that full-height finger guards are installed at each door with pivot hinges where door has a clearance at hinge side greater than 1/4 inch (6 mm) and less than 3/4 inch (19 mm) with door in any position.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. General: Comply with manufacturer’s recommendations. Install automatic door operators according to manufacturer's written instructions and cited BHMA standard for type of door operation and direction of pedestrian travel, including signage, controls, wiring, remote power units if any, and connection to building's power supply.
   1. Install complete power door operator system in accordance with manufacturer’s instructions, including controls, control wiring, and remote power units.
   2. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion.

3. Install operators true in alignment with established lines and door geometry without warp or rack. Anchor securely in place.

B. Controls: Install activation and safety devices according to manufacturer's written instructions and cited BHMA standard for operator type and direction of pedestrian travel. Connect control wiring.

C. Access-Control System: Connect operators to access-control system.

D. Signage: Apply on both sides of each door as required by cited BHMA standard for type of door operator and direction of pedestrian travel.

E. Set tracks, header assemblies, operating brackets, rails, and guides level and true to location with adequate anchorage for permanent support.

3.4 ADJUSTING

A. After repeated operation of completed installation equivalent to 3 days use by normal traffic (100 to 300 cycles), readjust door operators and controls for optimum operating condition and safety, and for a weathertight closure. Lubricate as recommended by manufacturer; comply with requirements of applicable BHMA standards.

3.5 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

B. Installation includes all related preparation, testing and adjustment as specified.

C. Electrical supply required will be performed by Electrical Contract, unless otherwise noted.

END OF SECTION 087113

SECTION 088000
GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Contract Documents apply to this Section.

1.2 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
1. Windows.
2. Doors.
3. Glazed curtain walls.
4. Storefront framing.
5. Glazed entrances.
6. Sloped glazing.
7. Skylights.
8. Interior borrowed lites.

B. Related Sections:

1. Division 08 Section "All-Glass Entrances and Storefronts."
2. Division 08 Section "Automatic Entrances."

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit.

1.4 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Design glass, including comprehensive engineering analysis according to **ASTM E 1300** and **ICC's 2017 International Building Code** by a qualified professional engineer, using the following design criteria:
1. Design Wind Pressures: As indicated on Drawings.
2. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
   a) Wind Design Data: As indicated on Drawings.
   b) Basic Wind Speed: 90 mph.
   c) Importance Factor: 6.

d) Exposure Category: B, C, and D.

3. Design Snow Loads: As indicated on Drawings.
4. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
5. Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass to resist each of the following combinations of loads:
   a) Outward design wind pressure minus the weight of the glass. Base design on glass type factors for short-duration load.
   b) Inward design wind pressure plus the weight of the glass plus half of the design snow load. Base design on glass type factors for short-duration load.
   c) Half of the inward design wind pressure plus the weight of the glass plus the design snow load. Base design on glass type factors for long-duration load.
6. Glass Type Factors for Wired, Patterned, and Sandblasted Glass:
   a) Short-Duration Glass Type Factor for Wired Glass: 0.5.
   b) Long-Duration Glass Type Factor for Wired Glass: 0.3.
   c) Short-Duration Glass Type Factor for Patterned Glass: 1.0.
   d) Long-Duration Glass Type Factor for Patterned Glass: 0.6.
   e) Short-Duration Glass Type Factor for Sandblasted Glass: 0.5.
7. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
8. Probability of Breakage for Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001.
9. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
10. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.5 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
   1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
   2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
   3. Test no fewer than eight (8) Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
   4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.6 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. LEED Submittals:

1. Product Data for Credit IEQ 4.1: For glazing sealants used inside the weatherproofing system, documentation including printed statement of VOC content.
2. Laboratory Test Reports for Credit IEQ 4: For glazing sealants used inside the weatherproofing system, documentation indicating that they comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
1. Tinted glass.
2. Patterned glass.
3. Coated glass.
4. Wired glass.
5. Fire-resistive glazing products.
6. Laminated glass with colored interlayer.
7. Insulating glass.

D. Glazing Accessory Samples: For gaskets, sealants and colored spacers, in 12-inch lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

E. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

F. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installers, manufacturers of insulating-glass units with sputter-coated, low-e coatings, glass testing agency and sealant testing agency.

B. Product Certificates: For glass and glazing products, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for tinted glass, coated glass, insulating glass, glazing sealants and glazing gaskets.
1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

D. Preconstruction adhesion and compatibility test report.

E. Warranties: Sample of special warranties.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

E. Source Limitations for Glass: Obtain ultraclear float glass, tinted float glass, coated float glass, laminated glass and insulating glass from single source from single manufacturer for each glass type.

F. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

H. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

I. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F, and the fire-resistance rating in minutes.

J. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

K. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Install glazing in mockups specified in Division 08 Section "Aluminum-Framed Entrances and Storefronts, Aluminum Windows," to match glazing systems required for Project, including glazing methods.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

L. Preinstallation Conference: Conduct conference at DCAS project site.
1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for glazing during and after installation.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.11 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
1. Warranty Period: Ten (10) years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
1. Warranty Period: **10** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

C. Windborne-Debris-Impact Resistance: Provide exterior glazing that passes **basic**-protection testing requirements in ASTM E 1996 for Wind Zone 1, Wind Zone 2, Wind Zone 3 and Wind Zone 4 when tested according to ASTM E 1886.

Test specimens shall be no smaller in width and length than glazing indicated for use on the Project and shall be installed in same manner as glazing indicated for use on the Project.

1. Large-Missile Test: For glazing located within 30 feet of grade.
2. Small-Missile Test: For glazing located more than 30 feet above grade.
3. Large-Missile Test: For all glazing, regardless of height above grade.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Ultraclear Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I, complying with other requirements specified and with visible light transmission not less than 91 percent and solar heat gain coefficient not less than 0.87.

1. Products: Subject to compliance with requirements, provide one of the following:
   a) AFG Industries, Inc.; Krystal Klear.
   b) Guardian Industries Corp.; Ultrawhite.
   c) Pilkington North America; Optiwhite.
   d) PPG Industries, Inc.; Starphire.
   e) Or Approved Equal.

C. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
2. For uncoated glass, comply with requirements for Condition A.
3. For coated vision glass, comply with requirements for Condition C (other coated glass).

D. Pyrolytic-Coated, Self-Cleaning, Low-Maintenance Glass: Clear float glass with a coating on first surface having both photocatalytic and hydrophilic properties that act to loosen dirt and to cause water to sheet evenly over the glass instead of beading.

1. Products: Subject to compliance with requirements, provide one of the following:
   a) AFG Industries, Inc.; Spotless Ti.
   b) Cardinal Glass Industries; LoE2 Plus.
   c) Pilkington North America; Activ.
   d) PPG Industries, Inc.; SunClean.
   e) Or Approved Equal.

E. Uncoated Tinted Float Glass: Class 2, complying with other requirements specified.

1. Products: Subject to compliance with requirements, provide one of the following:
   AFG Industries, Inc.; Spotless Ti.

a) Cardinal Glass Industries; LoE2 Plus.
b) Pilkington North America; Activ.
c) PPG Industries, Inc.; SunClean.
d) Or Approved Equal.

2. Basis-of-Design Product: Subject to compliance with requirements, provided by industry standards or comparable product by one of the following:
   a) AFG Industries, Inc.; Spotless Ti.
   b) Cardinal Glass Industries; LoE2 Plus.
   c) Pilkington North America; Activ.
   d) PPG Industries, Inc.; SunClean.
   e) Or Approved Equal.
3. Tint Color: Blue, Blue-green, Bronze, Green and Gray.
4. Visible Light Transmittance: 40 percent minimum.

F. Polished Wired Glass: ASTM C 1036, Type II, Class 1 (clear), Form 1, Quality-Q6, complying with ANSI Z97.1, Class C.
1. Products: Subject to compliance with requirements, provide one of the following:
   a) AFG Industries, Inc.; Spotless Ti.
   b) Cardinal Glass Industries; LoE2 Plus.
   c) Pilkington North America; Activ.
   d) PPG Industries, Inc.; SunClean.
   e) Or Approved Equal.
2. Mesh: M1 (diamond) and M2 (square).

G. Film-Faced Polished Wired Glass: ASTM C 1036, Type II, Class 1 (clear), Form 1, Quality-Q6 and complying with testing requirements in 16 CFR 1201 for Category II materials.
1. Products: Subject to compliance with requirements, provide one of the following:
   a) General wired glass.
   b) TPG Fire Glass
   c) Lamberts Wired Glass
   d) Or Approved Equal.
2. Mesh: M1 (diamond) and M2 (square).

H. Patterned Glass: ASTM C 1036, Type II, Class 1 (clear), Form 3; Quality-Q6, Finish F1 (patterned one side), Finish F2 (patterned both sides), Pattern P1 (linear), Pattern P2 (geometric), Pattern P3 (random) and Pattern P4 (special).
1. Products: Subject to compliance with requirements, provide one of the following:
   a) General wired glass.
   b) TPG Fire Glass
   c) Lamberts Wired Glass
   d) Or Approved Equal.

I. Tempered Patterned Glass: ASTM C 1048, Kind FT (fully tempered), Type II, Class 1 (clear), Form 3; Quality-Q6, Finish F1 (patterned one side), Finish F2 (patterned both sides), Pattern P1 (linear), Pattern P2 (geometric), Pattern P3 (random) and Pattern P4 (special).
1. Products: Subject to compliance with requirements, provide one of the following:
   a) SPG Glass Products.
   b) Architectural Glass
   c) M3 Glass
   d) Or Approved Equal

J. Patterned Wired Glass: ASTM C 1036, Type II, Class 1 (clear), Form 2, Quality-Q6, Finish F1 (patterned one side), Finish F2 (patterned both sides), Mesh M1 (diamond), Pattern P1 (linear), Pattern P2 (geometric), Pattern P3 (random) and Pattern P4 (special).
1. Products: Subject to compliance with requirements, provide one of the following:
   a) General wired glass.
   b) TPG Fire Glass
   c) Lamberts Wired Glass
   d) Or Approved Equal.

K. Ceramic-Coated Vision Glass: Heat-treated float glass, Condition C; with ceramic enamel applied by silk-screened process; complying with Specification No. 95-1-31 in GANA's Tempering Division's "Engineering Standards Manual" and with other requirements specified.
1. Products: Subject to compliance with requirements, provide one of the following:
   a) Prelco Spandrel Glass
   b) Viracom Spandrel Glass
   c) Hartung Glass Industries
   d) Or Approved Equal.
2. Basis-of-Design Product: Subject to compliance with requirements, provided by design professional or comparable product by one of the following:
   a) Prelco Spandrel Glass
   b) Viracom Spandrel Glass
   c) Hartung Glass Industries
   d) Or Approved Equal.
3. Glass: Clear float, Ultraclear float, and Tinted float.
4. Tint Color: Blue, Blue-green, Bronze, Green and Gray.
5. Ceramic Coating Color and Pattern: As selected by Architect from manufacturer's full range.

L. Reflective-Coated Vision Glass: ASTM C 1376, coated by pyrolytic process, vacuum deposition (sputter-coating) process, and complying with other requirements specified.
1. Products: Subject to compliance with requirements, provide one of the following:
   a) Vitro Glass
   b) AGC Glass Products
   c) Guardian Glass
   d) Or Approved Equal
2. Basis-of-Design Product: Subject to compliance with requirements, provide <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
   a) Vitro Glass
   b) AGC Glass Products
   c) Guardian Glass
   d) Or Approved Equal
3. Kind: Kind CV (coated vision glass), except that Kind CO (coated overhead glass) may be used where the lower edge of the glass is more than 6 feet above the adjacent floor level or cannot be approached closer than 10 feet.
4. Coating Color: Gold, Pewter, Silver.
5. Glass: Clear float and Tinted float.
6. Tint Color: Blue, Blue-green, Bronze, Green and Gray.
7. Visible Light Transmittance: 40 percent minimum.
8. Outdoor Visible Reflectance: 50 percent maximum.
9. Self-Cleaning, Low-Maintenance Coating: Pyrolytic coating on first surface.

M. Ceramic-Coated Spandrel Glass: ASTM C 1048, Condition B, Type I, Quality-Q3, and complying with other requirements specified.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a) Prelco Spandrel Glass
      b) Viracom Spandrel Glass
      c) Hartung Glass Industries
      d) Or Approved Equal.
   2. Basis-of-Design Product: Subject to compliance with requirements, provided by design or comparable product by one of the following:
      a) Prelco Spandrel Glass
      b) Viracom Spandrel Glass
      c) Hartung Glass Industries
      d) Or Approved Equal.
   3. Glass: Clear float, Ultraclear float and Tinted float.
   4. Tint Color: Blue, Blue-green, Bronze, Green and Gray.
   5. Ceramic Coating Color: As selected by Architect from manufacturer's full range.

N. Silicone-Coated Spandrel Glass: ASTM C 1048, Condition C, Type I, Quality-Q3, and complying with other requirements specified.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a) Pegasus Glass.
      b) Mapes Industries
      c) Guardian Industries
      d) Or approved Equal.
   2. Basis-of-Design Product: Subject to compliance with requirements, provided by the design professional or comparable product by one of the following:
      a) Pegasus Glass.
      b) Mapes Industries
      c) Guardian Industries
      d) Or Approved Equal.
   3. Glass: Clear float, Ultraclear float, Tinted float.
   4. Tint Color: Blue, Blue-green, Bronze, Green and Gray.
   5. Silicone Coating Color: As selected by Architect from manufacturer's full range.

O. Reflective-Coated Spandrel Glass: ASTM C 1376, Kind CS; coated by pyrolytic process or vacuum deposition (sputter-coating) process, and complying with other requirements specified.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a) Pegasus Glass.
      b) Mapes Industries
      c) Guardian Industries
      d) Or Approved Equal.
   2. Basis-of-Design Product: Subject to compliance with requirements, provide by the design professional or comparable product by one of the following:
      a) Pegasus Glass.
      b) Mapes Industries
      c) Guardian Industries
      d) Or Approved Equal.
   3. Coating Color: Gold, Pewter, and Silver.
   4. Glass: Clear float, Ultraclear float and Tinted float.
   5. Tint Color: Blue, Blue-green, Bronze, Green and Gray.

6. Visible Light Transmittance: 40 percent minimum.
7. Outdoor Visible Reflectance: 50 percent maximum.

2.3 LAMINATED GLASS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. W&W Laminated Glass
2. Viracon Laminated Glass
3. Hartung Glass Industries
4. Or Approved Equal.

B. Laminated Glass: ASTM C 1172 and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
1. Construction: Laminate glass with **polyvinyl butyral interlayer or cast-in-place and cured-transparent-resin interlayer** to comply with interlayer manufacturer's written recommendations.
2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

C. Windborne-Debris-Impact-Resistant Laminated Glass: ASTM C 1172 and complying with testing requirements in 16 CFR 1201 for Category II materials, with "Windborne-Debris-Impact Resistance" Paragraph in "Glass Products, General" Article, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
1. Construction: Laminate glass with one of the following to comply with interlayer manufacturer's written recommendations:
a) Polyvinyl butyral interlayer.
b) Polyvinyl butyral interlayers reinforced with polyethylene terephthalate film.
c) Ionoplast interlayer.
d) Cast-in-place and cured-transparent-resin interlayer.
e) Cast-in-place and cured-transparent-resin interlayer reinforced with polyethylene terephthalate film.
2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

D. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Laminated-Glass Types" Article.

2.4 INSULATING GLASS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Guardian Industries Glass.
2. Sanjing Insulated Glass Products.
3. Vitro Architectural Glass.
4. Or Approved Equal

B. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
1. Sealing System: Dual seal, with manufacturer's standard, polyisobutylene and polysulfide, polyisobutylene and silicone, polyisobutylene and hot-melt butyl polyisobutylene and polyurethane primary and secondary.
2. Spacer: Manufacturer's standard spacer material and construction, Aluminum with mill or clear anodic finish, Aluminum with black, color anodic finish, Aluminum with bronze, color anodic finish, Aluminum with powdered

metal paint finish in color selected by Architect, Galvanized steel, Stainless steel, Polypropylene covered stainless steel in color selected by Architect.

3. Desiccant: Molecular sieve or silica gel, or blend of both.

C. Glass: Comply with applicable requirements in "Glass Products" Article and in "Laminated Glass" Article] as indicated by designations in "Insulating-Glass Types" Article and in "Insulating-Laminated-Glass Types" Article.

2.5 FIRE-PROTECTION-RATED GLAZING

A. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door assemblies and NFPA 257 for window assemblies.

B. Monolithic Ceramic Glazing: Clear, ceramic flat glass; 3/16-inch nominal thickness.
1. Products: Subject to compliance with requirements, provide one of the following:
   a) Nippon Electric Glass Co., Ltd. (distributed by Technical Glass Products); Obscure FireLite, Premium FireLite and Standard FireLite.
   b) Safti First; SuperLite C/P.
   c) Schott North America, Inc.; Pyran Star and Pyran Crystal.
   d) Vetrotech Saint-Gobain; SGG Keralite FR-R.
   e) Or Approved Equal.

C. Film-Faced Ceramic Glazing: Clear, ceramic flat glass; 3/16-inch nominal thickness; faced on one surface with a clear glazing film; complying with testing requirements in 16 CFR 1201 for Category II materials.
1. Products: Subject to compliance with requirements, provide one of the following:
   a) Nippon Electric Glass Co., Ltd. (distributed by Technical Glass Products); FireLite NT.
   b) Safti First; SuperLite C/SP.
   c) Schott North America, Inc.; Filmed Pyran Star and Filmed Pyran Crystal.
   d) Vetrotech Saint-Gobain; SGG Keralite FR-F.
   e) Or Approved Equal.

D. Laminated Ceramic Glazing: Laminated glass made from 2 plies of clear, ceramic flat glass; 5/16-inch total nominal thickness; complying with testing requirements in 16 CFR 1201 for Category II materials.
1. Products: Subject to compliance with requirements, provide one of the following:
   a) Nippon Electric Glass Co., Ltd. (distributed by Technical Glass Products); FireLite Plus.
   b) Schott North America, Inc.; Laminated Pyran Crystal.
   c) Vetrotech Saint-Gobain; SGG Keralite FR-L.
   d) Or Approved Equal.

E. Fire-Protection-Rated Tempered Glass: 1/4-inch, 3/8-inch, 1/2-inch-thick, fire-protection-rated tempered glass, complying with testing requirements in 16 CFR 1201 for Category II materials.
1. Products: Subject to compliance with requirements, provide one of the following:
   a) InterEdge, Inc., a subsidiary of AFG Industries, Inc.; PyroEdge-20.
   b) Safti First; SuperLite20.
   c) Vetrotech Saint-Gobain; SSG Pyroswiss.
   d) Or Approved Equal.

F. Fire-Protection-Rated Laminated Glass: 5/16-inch-thick, fire-protection-rated laminated glass, complying with testing requirements in 16 CFR 1201 for Category II materials.
1. Products: Subject to compliance with requirements, provide one of the following:

a) Oldcastle Glass, Inc.; Pyroguard.
b) Or Approved Equal.

G. Laminated Glass with Intumescent Interlayers: Laminated glass made from multiple plies of uncoated, clear float glass; with intumescent interlayers; complying with testing requirements in 16 CFR 1201 for Category II materials.
1. Products: Subject to compliance with requirements, provide one of the following:
a) InterEdge, Inc., a subsidiary of AFG Industries, Inc.; Pyrobel.
b) Pilkington Group Limited (distributed by Technical Glass Products); PyroStop.
c) Vetrotech Saint-Gobain; SGG Contraflam N2 and SGG Swissflam N2.
d) Or Approved Equal.

H. Gel-Filled, Double-Glazing Units: Double glazing units made from two lites of uncoated, clear, fully tempered float glass; with a perimeter metal spacer separating lites and dual-edge seal enclosing a cavity filled with clear, fully transparent, heat-absorbing gel; complying with testing requirements in 16 CFR 1201 for Category II materials.
1. Products: Subject to compliance with requirements, provide one of the following:
a) Safti First; SuperLite II.
b) Or Approved Equal.

2.6 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
1. Neoprene complying with ASTM C 864.
2. EPDM complying with ASTM C 864.
3. Silicone complying with ASTM C 1115.
4. Thermoplastic polyolefin rubber complying with ASTM C 1115.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene, EPDM, silicone or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.
1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.7 GLAZING SEALANTS

A. General:
1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Sealants used inside the weatherproofing system, shall have a VOC content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
4. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
5. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a) Dow Corning Corporation; 790.
      b) GE Advanced Materials - Silicones; SilPruf LM SCS2700.
      c) May National Associates, Inc.; Bondaflex Sil 290.
      d) Pecora Corporation; 890.
      e) Sika Corporation, Construction Products Division; SikaSil-C990.
      f) Tremco Incorporated; Spectrem 1.
      g) Or Approved Equal.

C. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a) BASF Building Systems; Omniseal 50.
      b) Dow Corning Corporation; 756 SMS, 791, 795, 995.
      c) GE Advanced Materials - Silicones; SilGlaze II SCS2800, SilPruf NB SCS9000, SilPruf SCS2000 and UltraPruf II SCS2900.
      d) May National Associates, Inc.; Bondaflex Sil 295.
      e) Pecora Corporation; 864, 895, 898.
      f) Polymeric Systems, Inc.; PSI-641.
      g) Sika Corporation, Construction Products Division; SikaSil-C995.
      h) Tremco Incorporated; Spectrem 2 and Spectrem 3.
      i) Or Approve Equal.

D. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a) Dow Corning Corporation; 799.
      b) GE Advanced Materials - Silicones; UltraGlaze SSG4000 and UltraGlaze SSG4000AC.
      c) May National Associates, Inc.; Bondaflex Sil 200 GPN and Bondaflex Sil 201 FC.
      d) Polymeric Systems, Inc.; PSI-631.
      e) Schnee-Morehead, Inc., an ITW company; SM5731 Poly-Glaze Plus.
      f) Tremco Incorporated; Proglaze SSG and Tremsil 600.
      g) Or Approved Equal .

E. Glazing Sealant: Acid-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a) BASF Building Systems; OmniPlus.
      b) Bostik, Inc.; Chem-Calk 1200.
      c) Dow Corning Corporation; 999-A.
      d) GE Advanced Materials-Silicones; Contractors SCS1000 and Construction SCS1200.
      e) May National Associates, Inc.; Sil 100 GC, Sil 100 GP and Sil 100 WF.
      f) Pecora Corporation; 860.
      g) Polymeric Systems, Inc.; PSI-601.
      h) Schnee-Morehead, Inc., an ITW company; SM5732 Polyglaze.
      i) Tremco Incorporated; Proglaze and Tremsil 200.
      j) Or Approved Equal.

F. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.8 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.9 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.10 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

2.11 FIRE-PROTECTION-RATED GLAZING TYPES

A. Glass Type 1: 20-minute fire-rated glazing without hose-stream test; monolithic ceramic glazing, film-faced ceramic glazing, laminated ceramic glazing, fire-protection-rated tempered glass, fire-protection-rated laminated glass, or gel-filled, double glazing units.
   1. Provide safety glazing labeling.

B. Glass Type 2: 20-minute fire-rated glazing with hose-stream test; monolithic ceramic glazing, film-faced ceramic glazing, laminated ceramic glazing, or, gel-filled, double-glazing units.
   1. Provide safety glazing labeling.

C. Glass Type 3: 45-minute, 60-minute, 90-minute, 120-minute fire-rated glazing; monolithic ceramic glazing, film-faced ceramic glazing, laminated ceramic glazing, laminated glass with intumescent interlayers, or gel-filled, double-glazing units.
   1. Provide safety glazing labeling.

D. Glass Type 4: 45-minute, 60-minute, 90-minute, 120-minute fire-rated glazing with 450 deg F temperature rise limitation; laminated glass with intumescent interlayers or gel-filled, double-glazing units.
   1. Provide safety glazing labeling.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
   2. Presence and functioning of weep systems.
   3. Minimum required face and edge clearances.
   4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches.
   1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
   2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.Retain both paragraphs below if glazing with wedge-shaped gaskets is required for Project.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 LOCK-STRIP GASKET GLAZING

A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system unless otherwise indicated.

3.8 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

SECTION 092116
GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1- GENERAL

1.1 SUMMARY

A. Section Includes: Gypsum board shaft wall assemblies.

1.2 ACTION SUBMITTALS

A. Product Data: For each component of gypsum board shaft wall assembly.

B. Evaluation Reports: For shaft wall assemblies firestop tracks, from ICC-ES.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.4 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or with gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, or mold damaged.
   1. Indications that panels are wet, or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2- PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E 90 and classified according to ASTM E 413 by a testing and inspecting agency.

C. Low-Emitting Materials: Gypsum shaft wall assemblies shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing

of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

A. Fire-Resistance Rating: 1 to 4 hours

B. STC Rating: 51, minimum.

C. Studs: Manufacturer's standard profile for repetitive members, corner and end members, and fire-resistance-rated assembly indicated.
   1. Depth: As indicated.
   2. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm).

D. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 2 inches (51 mm) long and matching studs in depth.

E. Firestop Tracks: Provide firestop track at head of shaft wall on each floor level.

F. Insulation: Sound attenuation blankets.

2.3 PANEL PRODUCTS

A. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one- half of pre-consumer recycled content not less than 25 percent by weight.

B. Regional Materials: Gypsum panel products shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

C. Regional Materials: Gypsum panel products shall be manufactured within 500 miles (800 km) of Project site.

D. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

E. Gypsum Shaftliner Board, Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with paper faces.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. American Gypsum; Shaft Liner.
      b. CertainTeed Corp.; ProRoc Shaftliner.
      c. Georgia-Pacific Gypsum LLC, Subsidiary of Georgia Pacific; ToughRock Fireguard Shaftliner.
      d. Lafarge North America, Inc.; Firecheck Type X Shaftliner.
      e. National Gypsum Company; Gold Bond Brand Fire-Shield Shaftliner.
      f. PABCO Gypsum; Pabcore Shaftliner Type X.

g. Temple-Inland Inc.; Fire-Rated SilentGuard Gypsum Shaftliner System.
h. USG Corporation; Sheetrock Brand Gypsum Liner Panel.
i. Or an Approved Equal.

2. Thickness: 1 inch (25.4 mm).
3. Long Edges: Double bevel.

F. Gypsum Shaft liner Board, Moisture- and Mold-Resistant Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with moisture- and mold-resistant core and surfaces.

1. Products: Subject to compliance with requirements available products that may be incorporated into the Work include, but are not limited to, the following:
   a. CertainTeed Corp.; ProRoc Moisture and Mold Resistant Shaftliner.
   b. Georgia-Pacific Gypsum LLC, Subsidiary of Georgia Pacific; Dens-Glass Ultra Shaftliner.
   c. Lafarge North America, Inc.; Firecheck Moldcheck Type X Shaftliner.
   d. National Gypsum Company; Gold Bond Brand Fire-Shield Shaftliner XP.
   e. PABCO Gypsum; Pabcore Mold Curb Shaftliner Type X.
   f. Temple-Inland Inc.; Fire-Rated SilentGuard TS Mold-Resistant Gypsum Shaftliner System.
   g. USG Corporation; Sheetrock Brand Mold Tough Gypsum Liner Panel.
   h. Or an Approved Equal.
2. Thickness: 1 inch (25.4 mm).
3. Long Edges: Double bevel.
4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

G. Gypsum Board: As specified in Division 09 Section "Gypsum Board Shaft Wall Assemblies."

H. Gypsum Base for Gypsum Veneer Plaster: As specified in Division 09 Section "Gypsum Veneer Plastering."

I. Cementitious Backer Units: As specified in Division 09 Section "Gypsum Board Shaft Wall Assemblies." Division 09 Section "Tiling."

2.4 NON-LOAD-BEARING STEEL FRAMING

A. Recycled Content of Steel: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Steel Framing Members: Comply with ASTM C 645 requirements for metal unless otherwise indicated.

1. Protective Coating: Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40 (Z120) ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized unless otherwise indicated.

C. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance- rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of

studs.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Fire Trak Corp.; Fire Trak System attached to studs with Fire Trak Posi Klip.
   b. Grace Construction Products; FlameSafe FlowTrak System.
   c. Metal-Lite, Inc.; The System.
   d. Steel Network Inc. (The); VertiClip SLD VertiTrack VTD Series.
   e. Or an Approved Equal.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with manufacturer's written recommendations.

B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in Division 09 Section "Gypsum Board Assemblies" Division 09 Section "Gypsum Veneer Plastering" that comply with gypsum board shaft wall assembly manufacturer's written recommendations for application indicated.

C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.

D. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.
   1. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing according to ASTM E 488 conducted by a qualified testing agency.
   2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing according to ASTM E 1190 conducted by a qualified testing agency.

E. Sound Attenuation Blankets: As specified in Division 09 Section "Gypsum Board Shaft Wall Assemblies." Division 09 Section "Gypsum Veneer Plastering."

F. Acoustical Sealant: As specified in Division 09 Section "Gypsum Board Shaft Wall Assemblies." Division 09 Section "Gypsum Veneer Plastering."

PART 3- EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board shaft wall assemblies attach or abut, with Installer present, including hollow-metal frames, elevator hoistway door frames, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Sprayed Fire-Resistive Materials: Coordinate with gypsum board shaft wall assemblies so both elements of Work remain complete and undamaged. Patch or replace sprayed fire-resistive materials removed or damaged during installation of shaft wall assemblies to comply with requirements specified in Division 07 Section "Applied Fireproofing."

B. After sprayed fire-resistive materials are applied, remove only to extent necessary for installation of gypsum board shaft wall assemblies and without reducing the fire- resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLATION

A. General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and ASTM C 754 other than stud-spacing requirements.

B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.

C. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.
   1. Elevator Hoistway: At elevator hoistway-entrance door frames, provide jamb struts on each side of door frame.
   2. Reinforcing: Where handrails directly attach to gypsum board shaft wall assemblies, provide galvanized steel reinforcing strip with 0.033-inch (0.84-mm) minimum thickness of base metal (uncoated), accurately positioned and secured behind at least one layer of face panel.

D. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items. Ensure all firestopping is provided at penetrations as specified in Division 7 Penetration Firestopping.

E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.

F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated. Ensure all firestopping is provided in the fire rated shaftways.

G. Control Joints: Install control joints at locations indicated on Drawings according to ASTM C 840 and in specific locations approved by Architect while maintaining fire- resistance rating of

gypsum board shaft wall assemblies.

H. Sound-Rated Shaft Wall Assemblies: Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly.

I. Cant Panels: At projections into shaft exceeding 4 inches (102 mm), install 1/2- or 5/8- inch- (13- or 16-mm-) thick gypsum board cants covering tops of projections.
   1. Slope cant panels at least 75 degrees from horizontal. Set base edge of panels in adhesive and secure top edges to shaft walls at 24 inches (610 mm) o.c. with screws fastened to shaft wall framing.
   2. Where steel framing is required to support gypsum board cants, install framing at 24 inches (610 mm) o.c. and extend studs from the projection to shaft wall framing.

J. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.4 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

3.5 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

END OF SECTION 092116

SECTION 092300
GYPSUM PLASTERING

PART 1 – GENERAL

1.1 SUMMARY

A. Work Included: Provide lath and plaster work in accordance with the Contract Documents. The Work of this Section shall include but not be limited to the following:
   1. Metal urring and lathing.
   2. Suspension system for metal lath for plaster.
   3. Gypsum plastering with modified gypsum plaster finish coat.
   4. Portland cement plaster for security ceilings.
   5. Inspection and repair of existing furred and suspended metal lath.
   6. Cutting, patching and blending existing plaster.
   7. Patching of perlite plaster fireproofing.

B. Related Sections
   1. Section 024119- Demolition and removal of selected portions of buildings and site elements.
   2. Section 078100- Applied Fireproofing.
   3. Section 079200- Joint Sealants.
   4. Section 092900- Gypsum Drywall.
   5. Section 099101- Paint Removal.
   6. Section 099100- Painting.

1.2 DEFINITIONS- Defective Products

A. Plaster is considered defective if it is cracked, crumbling, crystallized or chalking, rust stained or if any layer is separated from its substrate.

B. Metal lath is considered defective if rust is exposed through plaster or if spacing of metal supports exceeds the performance criteria for that type of lath.

C. Furring and runners are considered defective if rust or damage has visibly reduced section of metal or if spacing of metal supports exceeds the performance criteria for suspended or furred ceiling or if furring and runners have been cut or damaged by attachment of ductwork or piping.

D. Wire ties are considered defective if rusted or damaged.

E. Hangers are considered defective if rust and damage have visibly reduced section. Hangers are considered defective if concrete slab exhibits cracking, spalling or efflorescence in the immediate area of hanger attachment to concrete slab.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage an Installer who has successfully completed within the last 5 years at least 5 lath and plaster projects similar to this Project.

B. Coordination of Work: Coordinate layout and installation of suspension system for suspended ceilings and soffits with other work supported by, or penetrating through, ceilings and soffits prior to installation.
   1. Proceed with re-supporting of primary and secondary furring, runners and hangers only after mechanical, plumbing, fire protection and electrical coordination is completed and approved.
   2. Coordinate with removal trades and masonry trades to maintain masonry supports of furring channels.
   3. Coordinate with fireproofing trades to assist in the location and sequence of repair to fireproofing of new and existing structure prior to the installation of plaster work.

C. Metal Lath and Framing Standards: Comply with the applicable requirements of the following standards:
   1. "Specifications for Metal Lath and Furring" by the Metal Lath/Steel Framing Association.
   2. "Specification for Metal Lath and Furring" by the NAAMM.

1.4 MOCK-UPS AND TESTING

A. Field Mock-Ups: Prior to plastering, provide 4' x 4' mock-ups panels for each type of finish and application required, where directed. Show the proposed range of color, texture and workmanship to be expected in completed work. Obtain Resident Engineer's acceptance of panels visual quality before start of work. Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

B. Provide field mock-ups as follows:
   1. Suspended plaster blended to existing plaster.
   2. Plaster on furred metal lath wall blended to existing plaster.
   3. Plaster on concrete masonry unit blended to existing plaster.
   4. Simulate finished lighting conditions for review of mockups.
   5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's product data for plaster materials, additives, admixtures, lath, metal supports and accessories.

B. Material Certificates: Submit producer's certificate for each kind of plaster aggregate to show that materials comply with requirements.

C. Field verify the location of main runners and indicate them on coordination drawings.

D. Fireproofing Data: Submit UL Design Number(s) for proposed assemblies along with UL description of assemblies and approvals as required by New York City Building Code.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original containers with identification of product and manufacturer.

B. Store materials inside, under cover and keep them dry, protected from weather, contamination,

aging, corrosion, and damage. Protect metal corner beads and trim from being bent or damaged.

1.7 PROJECT CONDITIONS

A. Environmental Requirements, General: Comply with requirements of plaster application standards and recommendations of plaster manufacturer for environmental conditions before, during, and after application of plaster.

B. Maintain a uniform temperature of not less than 55 deg. F, nor more than 80 deg. F, for not less than 1 week before plaster application, during application, and until plaster is dry but for not less than one week after application.

C. Ventilation: Ventilate building spaces to remove excess moisture, immediately after plaster is applied and until it sets. Maintain adequate ventilation to control humidity (between 40 and 75% relative humidity) for one week prior, during and at least one week after plaster application.

D. Protect contiguous work from soiling, splattering and other harmful effects which might result from plastering.

E. Do not apply over saturated masonry surfaces including furred systems. Notify Owner's Representative immediately if conditions are encountered.

F. Dust: Schedule installation and protect masonry, gypsum lath, intermediate plaster coats and finish coats from dust and debris which may affect bonding.

G. Avoid conditions that result in gypsum plaster drying out too quickly.
1. Distribute heat evenly; prevent concentrated or uneven heat on plaster.
2. Maintain relative humidity levels for prevailing ambient temperature that produce normal drying conditions.
3. Ventilate building spaces in a manner that prevents drafts of air from contacting surfaces during plaster application and until plaster is dry.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. General: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

B. Manufacturers of Metal Lath and Accessories
1. Gold Bond Building Products Div., National Gypsum Co.
2. Milcor Division; Inryco, Inc.
3. United States Gypsum Co.
4. Or an Approved Equal.

C. Manufacturers of Gypsum Plaster, Base Coat and Finish Coat Lime
1. Gold Bond Building Products Div., National Gypsum Co.
2. United States Gypsum Co.
3. Or an Approved Equal.

D. Manufacturers for Portland Cement

1. Lone Star Cement.
2. Lehigh Portland Cement Company.
3. Or an Approved Equal.

E. Manufacturers of Bonding Agents
1. Larsen Products Corporation.
2. Thoro Bond.
3. Or an Approved Equal.

F. Reinforcing Fibers
1. Sisal hemp fibers: Plastic Tooling Co., Extron, PA.
2. Polypropylene Fibers: Fibermesh Co., Oakdale, NY.
3. Or an Approved Equal.

2.2 METAL SUPPORTS FOR CEILINGS AND SOFFITS

A. General: Size metal ceiling supports to comply with the following, unless otherwise indicated or required by New York City Building Code.
1. Interior Lathing and Furring: ASTM C 841.
2. Lathing and Furring for Portland Cement Plaster: ASTM C 1063.

B. Wire for Ties: ASTM A 641, 18 gauge minimum, Class 1 zinc coating, soft temper.

C. Rod or Flat Hangers: Mild steel, zinc or cadmium coated, 1/4" rods unless otherwise shown per required to meet code requirements. Flat hangers: min. 3/16" x 1" mild steel, galvanized per ASTM A 123.

D. Channels For Indirect Ceiling Systems: Cold-rolled steel, 0.0598" minimum thickness of base metal, allowable bending stress of 18,000 psi, with rust inhibitive paint or galvanizing complying with ASTM A 525 for G60 coating designation, and as follows:
1. Carrying Channels: 1-1/2" deep x 7/16" wide flanges, 475 lbs. per 1000' painted, 508 lbs. per 1000" galvanized.
2. Furring Channels: 3/4" deep x 7/16" wide flanges, 300 lbs per 1000' painted, 316 lbs per 1000' galvanized.
3. Steel Studs for Furring Channels: ASTM C 645, minimum 0.0179-inch thickness of base metal. Provide standard depth as shown.
4. Steel Rigid Furring Channels: ASTM C 645, hat-shaped, depth of 7/8 inch, and minimum of 0.0179-inch thickness of base metal.
5. Attachment of Furring to Suspended Members: Minimum 130-degree bend at rods and 3/8 inch round head stove bolts at flat hangers.

E. Support Systems: Support System components to meet requirements of New York City Building Code.

F. Hanger Anchorage Devices: Provide devices appropriate for anchorage to the structure whose suitability has been proven through certified test data, and as follows:
1. General: Size devices to develop full strength of hanger but not less than 3 times calculated hanger loading, except size direct pull-out concrete inserts for 5 times the calculated hanger loading. All hanger anchorage shall support a minimum of 200 pounds deadload.

2. Concrete Slabs- 4” Minimum: Provide drilled expansion type anchors of size to suit the load.
3. Provide appropriate code approved hangers where other support conditions exist.

2.3 LATH

A. Expanded Metal Lath: Provide lath complying with ASTM C 847 for type, configuration and other characteristics indicated below, painted after fabrication.
   1. Diamond Mesh Lath: Comply with the following requirements:
      a. Configuration: Flat or self-furring as applicable to substrate.
      b. Weight: 3.4 lbs. per sq. yd.

B. Lath Attachment Devices: Devices as required by referenced standards and recommended by lath manufacturer for secure attachment of lath.

2.4 PLASTER ACCESSORIES

A. General: Comply with ASTM C 1063; coordinate depth of accessories with thicknesses of plaster.

B. Metal Corner Reinforcement: Expanded large-mesh diamond mesh lath fabricated from zinc-alloy or welded wire mesh fabricated from 0.0475-inch-diameter zinc-coated (galvanized) wire and specially formed to reinforce external corners of Portland cement plaster on exterior exposures while allowing full plaster encasement.

C. Metal Corner Beads: Small nose corner beads fabricated from zinc alloy, with expanded flanges of large-mesh diamond lath to allow full encasement by plaster.

D. Strip Reinforcement: Smooth edge strips of expanded metal lath fabricated from painted or zinc-coated (galvanized) steel sheet.

E. Casing Beads: Square-edged style, with 7/8” expanded metal flanges to suit plaster bases indicated; of zinc-coated (galvanized) steel.

F. Control Joint: Galvanized steel “M” and “W” type. Taped joints at flat or re-entrant corners- 7/8” expanded metal ground.

2.5 LIME PORTLAND CEMENT PLASTER MATERIALS

A. Base Coat Cement: ASTM C 150, Type I or II, Portland cement and autoclaved lime complying with ASTM C 270.

B. Finish Coat: The finish coat shall consist of lime (ASTM C 206, Type S) and gypsum gauging plaster (ASTM C 28) for smooth trowel finish.

C. Aggregate for Base Coats: ASTM C 897.

D. Aggregate for Finish Coat: ASTM C 897, manufactured from white sand.

E. Fibers for Base Coat: Sisal hemp fibers or alkaline-resistant glass or polypropylene fibers, 1/2 inch long, free of contaminants, manufactured for use in Portland cement plaster.

2.6 PORTLAND CEMENT PLASTER MIXES AND COMPOSITIONS

A. General: Comply with ASTM C 926 for Portland cement plaster base and finish coat mixes as applicable to plaster bases, materials, and other requirements indicated.

B. Portland Cement Plaster Base Coat Mixes and Compositions: Proportion materials for respective base coats in parts by volume for cementitious materials and in parts by volume per sum of cementitious materials for aggregates to comply with the following requirements for each method of application and plaster base indicated. Adjust mix proportions below within limits specified to attain workability.
   1. Fiber Content: Add fiber to following mixes after ingredients have mixed at least 2 minutes. Comply with fiber manufacturer's directions but do not exceed 2 lbs. per cu. ft. of cementitious materials. Reduce aggregate quantities accordingly to maintain workability.

C. Three-Coat work Over Metal Lath: Base coats as indicated below:
   1. Scratch Coat: 15 percent Portland cement to 85 percent lime, 2-1/2 to 3 parts sand.
   2. Brown Coat: 15 percent Portland cement to 85 percent lime, 3 parts sand.

D. Job-Mixed Plaster Finish Coat:
   1. For Gypsum Gauging Plaster: 1 part gypsum gauging plaster and 2 parts lime. Comply with ASTM C 842.

E. Crack Patching in Plaster Base Coat:
   1. Brown Coat: 15 percent Portland cement to 85 percent lime, and fine (100% passing through 30 mesh screen) silica sand aggregate and 2 to 1 ratio of water to polymer admixture.

F. Crack Patching in Gypsum Finish Coat:
   1. Finish Coat: 1 part gauging plaster and 2 parts lime putty and 2 to 1 ratio of water to polymer admixture.

2.7 MISCELLANEOUS MATERIALS

A. Water for Plaster: Drinkable, free of substances capable of affecting plaster or of damaging lath or accessories.

B. Bonding Agent for Portland Cement Plaster: ASTM C 631, equal to "Plaster Weld" by Larsen Products Corp.

C. Acid Etch Solution: Muriatic acid mixed one part acid to 6 to 10 parts water.

2.8 MIXING

A. Mechanically mix cementitious and aggregate materials for plasters to comply with applicable referenced application standard and with recommendations of plaster manufacturer.

2.9 GYPSUM PLASTER MATERIALS, USED AS FIREPROOFING

A. Base Coat Plaster: ASTM C 28, gypsum ready-mixed plaster with perlite aggregate.

B. Finish Coat Plaster: High-strength gypsum gauging plaster, ASTM C 28, with a minimum average dry compressive strength of 5,000 psi per ASTM C 472 for a neat mix.

C. Finishing Hydrated Lime: ASTM C 206, Type N, normal hydrated lime for finishing purposes.

D. Aggregates for Base Coat Plaster: ASTM C 35; graded per ASTM C 842, perlite aggregate.

E. Manufacturers of Perlite Plaster:
1. Pennsylvania Perlite Corp. of York.
2. Redco, Inc.
3. Supreme Perlite Co.
4. Zonolite Construction Products, Division of W.R. Grace & Co.
5. Or an Approved Equal.

2.10 GYPSUM PLASTER MIX AND COMPOSITION USED AS FIREPROOFING

A. Plaster Base Coat Composition: Comply with ASTM C 842 and manufacturer's directions for gypsum plaster base coat proportions that correspond to application method and plaster bases indicated below. Comply with UL Design and New York City Building Code requirements regarding mix design.
1. Three-Coat Work Over Metal Lath: Base coats, as indicated below:
a. Scratch Coat: High-strength gypsum plaster with perlite aggregate.
b. Brown Coat: High-strength gypsum plaster with perlite aggregate.

2. Finish Coat: Proportion materials in parts by dry weight for finish coat to comply with the following requirements. Troweled Finishes: Finish coat as indicated below:
a. High-Strength Gypsum Gauging Plaster: Proportion as indicated below: 1 part plaster and 1 part lime.

PART 3 – EXECUTION

3.1 INSTALLATION OF LATHING AND FURRING, GENERAL

A. Interior Lathing and Furring Installation Standard: Install lathing and furring materials for Portland cement plaster to comply with ASTM C 1063 and the Standards stated hereinbefore.

B. Supplementary Framing: Install supplementary framing, at terminations in the work and for support of fixtures, toilet accessories, and similar work to comply with recommendations of gypsum plaster manufacturer, or "Gypsum Construction Handbook" published by United States Gypsum Co.

C. Isolation: Isolate lathing and metal support system to prevent transfer of structural loading into the work. Install slip or cushion type joints to absorb deflections but maintain lateral support.
1. Frame both sides of control and expansion joints independently, and do not bridge joints with furring and lathing.

3.2 INSTALLATION OF CEILING AND SOFFIT SUSPENSION SYSTEMS

A. Preparation and Coordination: Coordinate installation of suspension systems with overhead structural systems to ensure that anchorage provisions will receive ceiling hangers in a manner that will develop their full strength and at required spacings.

B. Hanger Installation: Attach hangers to structure above ceiling to comply with ML/SFA "Specifications for Metal Lathing and Furring" and with referenced standards. Do not use metal deck tabs. Where structure above is not adequate to support suspension system attach suspension system to supplemental support system specified in Division 5.

C. Reuse of Existing Hangers: Replace defective hanger with materials to meet the performance criteria herein.

D. Reuse of Existing Furring and Suspension Systems: Replace existing defective metal lath suspension systems with materials to meet the performance criteria.

E. Partial Reuse of Existing Furred or Suspended Ceilings: Cut back all runners and re- support with new hangers to meet performance criteria. Provide runner parallel along entire perimeter of cut back area within 8" of cut edges if none exist to remain. Repair existing cut carrying angles with splices to develop full strength or replace carrying angle. Reattach loose hanger supports.

F. Install suspension system components of sizes and spacings required by referenced lathing and furring installation standards. The following sizes are minimum. Increase sizes to accommodate loading as required by New York City Building Code.
   1. Hangers: Space hangers not over 4'-0" o.c. parallel with, and not over 3'-0" perpendicular to, direction of carrying and angles channels, unless otherwise indicated, and within 6" of carrying channel ends. Do not increase existing spacing at hangers at existing angles and channels.
   2. Carrying Channels: Space carrying channels not over 3'-0" o.c. with 4'-0" o.c. hanger spacing.
   3. Furring Channels to Receive Metal Lath: Space furring channels not over 16" o.c. for 3.4 lb. diamond mesh lath.

3.3 EXISTING CEILING SUSPENSION SYSTEMS LEFT IN PLACE

A. General: Inspect areas requiring patching. Examine existing suspension system. Where suspension system support members are damaged, the covering plaster and lath or other finish, must be removed to the extent necessary to permit the repairs to be made. Damaged elements that shall be removed include, but are not limited to, furring members that are defective or otherwise unsuitable for reuse; and hangers and hanger attachments that are unsuitable for reuse. Unsuitable for reuse means that the hanger cannot support the imposed loads.

B. Existing hangers and hanger attachments that have been left in place where suspended ceiling furring has been removed shall be examined to verify their suitability to support the new furring. Those found to be unsuitable shall be removed by cutting close to slab. Existing hangers that are sound, adequate, and suitable for reuse may be left in place, or removed, cleaned and reused.

C. For patching existing ceilings, use approved hangers and hanger attachments. Provide new hangers and attachments where existing have been removed or improperly placed or otherwise unsuitable, and where there are no existing hangers.

D. Splice new furring members to existing members using procedures recommended by furring

manufacturer for splice joint.

E. Prime all exposed metal with the exception of zinc coated or stainless steel members with a zinc rich primer.

F. Schedule work to eliminate other trades from loading suspension systems after repairs and new work is installed.

3.4 METAL LATHING

A. Install expanded metal lath for the following applications, to comply with referenced lathing installation standards.
   1. Ceilings, Soffits and Walls: Diamond mesh lath, 3.4 lbs. per sq. yd.

B. Existing metal lath that is defective or otherwise unsuitable shall be removed. 4" minimum at sound lath shall be left exposed to tie to the new lath.
   1. Provide new metal lath where existing has been removed. Metal lath shall be lapped over and tied to existing lath following procedures recommended by lath manufacturer for joining sections of lath and referenced lathing installation standards.
   2. Cracks shall be widened to about 6". The plaster shall be removed down to the lath or solid substrate. Strip lath shall be placed over substrate, centered at the location of the crack, and securely fastened in place before the plaster is repaired.
   3. Install metal lath to comply with referenced standards unless indicated otherwise. Lath for patching and extending existing work shall match existing installation, but never should be of less quality or of different design from those currently recognized as proper for that installation.
   4. Any trace of paint, dirt, oil, grease and/ or other foreign matter shall be removed from surfaces to receive new lath or plaster.

3.5 INSTALLATION OF PLASTERING ACCESSORIES

A. General: Comply with referenced lathing and furring installation standards for installation of plaster accessories. Miter or cope accessories at corners; install with tight joints and in alignment. Attach accessories securely to plaster bases.

B. Accessories: Provide the following:
   1. Corner Reinforcement: Install at external corners.
   2. Corner Beads: Install at external corners.
   3. Casing Beads: Install at all terminations of plaster work, at all mechanical, electrical, communications and other miscellaneous openings in the plaster work, except where plaster passes behind and is concealed by other work.
   4. Control Joints: Install control joints at locations indicated or, if not indicated, at locations complying with the following criteria and approved by Resident Engineer.
      a. Where plaster panel sizes or dimensions change, extend joints full width or height of plaster membrane.
      b. For Lime Portland Cement Plaster: Where distances between and areas within control joints exceed, respectively, the following measurements: 30 feet in either direction.

C. Existing Plaster Accessories: Remove where damaged and where necessary to carry out the work.
   1. Install new plaster accessories where existing accessories have been removed. Anchor securely

to substrates. Match lines of existing accessories where the total plaster thickness increases because new plaster is placed over existing plaster, it will be necessary to remove the existing accessories and provide new accessories properly sized for the new conditions.

3.6 PLASTER APPLICATION, GENERAL

A. Prepare monolithic surfaces for bonded base coats and use bonding compound or agent to comply with requirements of referenced plaster application standards for conditioning of monolithic surfaces.

B. Tolerances: Do not deviate more than 1/8” in 10’-0” from a true plane in finished plaster surfaces, as measured by a 10’-0” straightedge placed at any location on surface.

C. Grout hollow metal frames, with base coat plaster and prior to lathing where necessary. Except where full grouting is required for fire-resistance rating, grout 6” lengths at each anchorage.

D. Sequence plaster application with the installation and protection of other work, so that neither will be damaged by the other.

E. Plaster flush with metal frames and other built-in metal items, unless otherwise indicated. Where plaster is not terminated at metal by casing beads, cut base coat free from metal before plaster sets and groove finish coat at the junctures with metal.

F. Apply thicknesses and number of coats of plaster as indicated; or as required by referenced standards. Minimum thickness is 3/4” and as required to match existing adjoining work.

G. Concealed Plaster: Where plaster will be permanently concealed, finish-coat may be omitted; where concealed behind cabinets, furnishings and equipment, apply finish-coat; where used as a base for adhered finishes, omit finish-coat and coordinate thickness with dimension as shown, and comply with tolerances specified.

H. General: Comply with ASTM C 842
   1. Do not deviate more than plus or minus 1/8 inch in 10 feet (3 mm in 3 m) from a true plane in finished plaster surfaces when measured by a 10-foot (3-m) straightedge placed on surface.
   2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
   3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.

3.7 LIME PORTLAND CEMENT PLASTER APPLICATION

A. Plaster Application Standard: Apply Portland cement plaster materials, compositions, and mixes to comply with ASTM C 926. Minimum thickness for plaster work is 3/4 inch and as required to match existing adjoining work.

B. Number of Coats: Apply plaster as three-coat work of composition indicated.
   1. Finish Coat: Trowel finish unless otherwise indicated; match Resident Engineer’s sample for

texture and color.

C. Time between coats shall allow for adequate plaster and bonding agent curing and drying.

3.8 CUTTING, PATCHING AND RESTORATION OF PLASTER

A. General: Cut, patch, point-up, repair and/ or restore new and existing plaster as necessary to accommodate other work and to repair defects, and where bond to the substrate has failed. Use initial patches as mock-ups, when approved, for subsequent repairs.

B. Defective Plaster: Carefully remove soft, deteriorated, weak, unbounded, cracked, effloresced, broken, loose, re-crystallized, and otherwise damaged existing plaster back to masonry or lath and to solid adjacent plaster. The edges shall be rectilinear, clean, sharp, and beveled inward to permit keying repairs into existing materials.
   1. Remove plaster by layers until a sound, well-adhered layer is encountered.
   2. Unsound or poorly adhered base coats shall be removed in step fashion so that each new coat in the path will lap over the underlying existing plaster coat.
   3. Cracks: Enlarge cracks that are 1/16” wide or wider. Cut back to solid substrate using carborundum-tipped saw blade. Cut perpendicular to surface and straight. Do not further enlarge cracks except to remove soft, broken, or loose materials or to repair backup materials. Where approved, widen cracks and install strip lath over substrate centered at location of cracking before making plaster repairs.
   4. Do not attempt to repair cracks until the underlying cause of the cracks has been identified and eliminated.
   5. Do not attempt to repair more cracks than can be finished before the patching plaster has had a chance to set up.

C. Patching: Clean, prepare surface and moisten existing plaster to be patched, apply bonding agent and plaster to comply with referenced standards and manufacturer’s recommendations. Finish coat patching over stable base coats will be acceptable. Where existing substrate is wire lath apply plaster following recommendation for new work on wire lath.
   1. Direct Plastering: Except where metal lath is indicated, etch concrete and masonry surfaces for direct plastering. Wet surface, scrub with acid etch solution and rinse thoroughly; repeat if necessary for adequate plaster bond. Protect all adjacent materials from acid contact.
   2. Bonding Agents: Apply to every surface that will receive plaster. Apply complete bond coat over existing and new lime Portland cement plaster base coat prior to application of finish coat. Surfaces to which bonding agent is to be applied shall be clean and free from substances that will affect bond. Follow bonding agent manufacturer’s recommendations in every instance. Permit bonding agent to dry properly before applying plaster. Do not exceed manufacturer’s recommendations for application of plaster to bonding agent. Do not apply plaster to bonding agents contaminated with dust. Coordinate drying and curing time of plaster with application of bonding agents to prevent excessive drying of bonding agent.
   3. Cleaning and Dampening Substrates: Sweep masonry and lath clean immediately before plaster is applied, and a bonding agent is applied. Dampen surfaces of existing plaster, unless the bonding agent manufacturer recommends otherwise.
   4. Thickness and Number of Coats: At patches and extensions in existing work, match thickness of existing plaster, and make finish of patch or extension flush with existing plaster. New plaster patches or extensions, including all coats shall match adjacent, existing plaster thickness.
   5. Each coat shall be allowed to cure and dry thoroughly before the succeeding coat is applied. Full-thickness patches shall be built-up in layers, the same as new work. Extensions and full-

thickness patches shall be made using three-coat plaster applications. Two-coat plaster applications will be limited to those recommended by the plaster manufacturer and permitted by applicable ASTM standards and governing regulations.

6. Apply final coat of plaster to match and blend with existing plaster, where applicable.
7. After finishing plaster patches, remove plaster residue and lime from the plaster surface using clear water. When the water has dried, wipe the area with clean dry rags to remove plaster dust completely.

D. Finish: Sand smooth-troweled finishes lightly to remove trowel marks and arises. Repairs and extensions shall match existing finishes and be blended so that patches and extensions are indiscernible.

E. Replace plaster materials that are tested by other to contain excessive alkalis.

F. All surfaces are to be inspected by the painting contractor with the plaster contractor. Perform all required remedial work, to provide acceptable surfaces, ready for painting.

3.9 GYPSUM PLASTER APPLICATION USED AS FIREPROOFING

A. Interior Gypsum Plaster Application Standard: Apply gypsum plaster materials, composition, mixes, and finishes indicated to comply with ASTM C 842 and the UL Fire Resistance Directory and the requirements of the New York City Building Code.

B. Number of Coats: Apply gypsum plaster, of composition indicated, to comply with the following requirements.

1. Use three-coat work over metal lath or as required to achieve the fire resistance rating of the structural member that is patched.

C. Finish Coat: Apply finish coat to comply with the following requirements:

1. Troweled finish for gypsum finish coat plaster.

3.10 CLEANING AND PROTECTION

A. Remove temporary protection and enclosure of other work. Promptly remove plaster from surfaces which are not to be plastered. Repair floors, walls and other surfaces which have been stained, or damaged by plastering work. When plastering work is completed, remove unused materials, containers and equipment and clean floors of plaster debris.

B. Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures plaster work being without damage or deterioration at time of Final Acceptance.

C. Protect furniture, equipment, carpet, light fixtures, fan coil enclosures, etc., at no additional cost to the Owner, including time required if the Contractor is required to return to correct plaster or painting deficiencies due to failure in workmanship or materials or an inability to meet the schedule.

3.11 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

B. Suspension system for lath and plaster, up to and including 4’-0” from the structure above, is deemed in the Unit Price.

END OF SECTION 092300

SECTION 092613
GYPSUM VENEER PLASTERING

PART 1 – GENERAL

1.1 SUMMARY

A. Work Included: Provide veneer plaster in accordance with the Contract Documents. The Work of this Section shall include but not be limited to the following:
   1. Steel framing members to receive gypsum base.
   2. Gypsum base screwed to steel framing.
   3. Two-component veneer plastering over gypsum base.
   4. Finishing of veneer plasterwork.

B. Related Sections
   1. Section 092300- Gypsum Plastering.
   2. Section 092900- Gypsum Drywall.
   3. Section 099100- Painting.

1.2 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA 505 for definitions of terms for gypsum board construction not otherwise defined in this section or other referenced standards.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each type of product specified.

1.4 QUALITY ASSURANCE

A. Fire-Resistance Ratings: Where indicated, match assemblies whose fire resistance rating has been determined per ASTM E 119 by a testing agency acceptable to authorities having jurisdiction and in compliance with the New York City Building Code.

B. Single Source: Obtain veneer plaster products from a single manufacturer for each veneer plaster system indicated.

C. Mockups: Provide a full-thickness finish mockup for each type and finish of gypsum veneer plaster and substrate to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Architect will select representative surfaces and conditions for application of each type of gypsum veneer plaster and substrate.
   2. Provide mockups of ceilings and partitions in sizes of at least 100 sq. ft. (9 sq. m).
   3. Apply gypsum veneer plaster, according to requirements for the completed Work, after
   4. permanent lighting and other environmental services have been activated.
   5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage, dirt and deterioration. Neatly stack gypsum base flat to prevent sagging.

C. Handle gypsum base to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Maintain proper conditions for application of veneer plaster to comply with ASTM C 843 and with veneer plaster manufacturer's recommendations.

B. Minimum Room Temperatures: Maintain not less than 50 deg. F, nor more than 80 deg F for one week before plaster application and until veneer plaster has fully dried. Distribute heat evenly; prevent concentrated or uneven heat on veneer plaster.

C. Ventilate building spaces to remove excess moisture. Avoid conditions which result in veneer plaster drying too rapidly.

D. Avoid conditions that result in gypsum veneer plaster drying too rapidly.
   1. Distribute heat evenly; prevent concentrated or uneven heat on veneer plaster.
   2. Maintain relative humidity levels, for prevailing ambient temperature, that produce normal drying conditions.
   3. Ventilate building spaces in a manner that prevents drafts of air from contacting surfaces during veneer plaster application until it is dry.

E. Do not install panels that are wet, moisture damaged, mold damaged, or faded from overexposure to sunlight.
   1. Indications that panels are wet, or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2- PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include but are not limited to the following:
   1. Steel Framing and Furring:
      a. Bostwick Steel Framing Co.
      b. Gold Bond Div., National Gypsum Co.
      c. United States Gypsum Co.
      d. Or an Approved Equal.
   2. Veneer Plaster Products:

a. Georgia Pacific Corp.
b. Gold Bond Div., National Gypsum Co.
c. United States Gypsum Co.
d. Or an Approved Equal.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.3 METAL SUPPORTS FOR CEILINGS AND SOFFITS

A. General: Size metal ceiling supports to comply with the following, unless otherwise indicated or required by New York City Building Code.
1. Interior Lathing and Furring: ASTM C 841.
2. Lathing and Furring for Portland Cement Plaster: ASTM C 1063.

B. Wire for Ties: ASTM A 641, 18 gauge minimum, Class 1 zinc coating, soft temper.

C. Rod or Flat Hangers: Mild steel, zinc or cadmium coated, 1/4” rods unless otherwise shown pr required to meet code requirements. Flat hangers: min. 3/16” x 1” mild steel, galvanized per ASTM A 123.

D. Channels For Indirect Ceiling Systems: Cold-rolled steel, 0.0598” minimum thickness of base metal, allowable bending stress of 18,000 psi, with rust inhibitive paint or galvanizing complying with ASTM A 525 for G60 coating designation, and as follows:
1. Carrying Channels: 1-1/2” deep x 7/16” wide flanges, 475 lbs. per 1000’ painted, 508 lbs. per 1000’ galvanized.
2. Furring Channels: 3/4” deep x 7/16” wide flanges, 300 lbs per 1000’ painted, 316 lbs per 1000’ galvanized.
3. Steel Studs for Furring Channels: ASTM C 645, minimum 0.0179-inch thickness of base metal. Provide standard depth as shown.
4. Steel Rigid Furring Channels: ASTM C 645, hat-shaped, depth of 7/8 inch, and minimum of 0.0179-inch thickness of base metal.
5. Attachment of Furring to Suspended Members: Minimum 130-degree bend at rods and 3/8 inch round head stove bolts at flat hangers.

E. Support Systems: Support System components to meet requirements of New York City Building Code.

F. Hanger Anchorage Devices: Provide devices appropriate for anchorage to the structure whose suitability has been proven through certified test data, and as follows:
1. General: Size devices to develop full strength of hanger but not less than 3 times calculated hanger loading, except size direct pull-out concrete inserts for 5 times the calculated hanger

loading. All hanger anchorage shall support a minimum of 200 pounds deadload.
2. Concrete Slabs- 4" Minimum: Provide drilled expansion type anchors of size to suit the load.
3. Provide appropriate code approved hangers where other support conditions exist.

2.4 STEEL FRAMING FOR WALLS

A. Steel Studs and Runners: ASTM C 645, Thickness: 22 gage (for partitions up to and including 10') and 20 gage (for partitions over 10' high).

B. Steel Rigid Furring Channels: ASTM C 645, hat-shaped, 7/8 inch depth and 0.0179 inch minimum thickness of base (uncoated) metal.

C. Furring Brackets: Serrated-arm type, adjustable, complying with ASTM C 645, minimum thickness of base metal of 0.0329 inch.

D. Z-Furring Members: Standard zee-shaped members of galvanized steel sheet complying with ASTM A 525, Coating Designation G60; with a minimum base metal thickness of 0.0179 inch, and of depth to fit insulation thickness indicated.

E. Fasteners: Provide fasteners recommended by the veneer plaster manufacturer to fasten steel framing and furring members securely.

2.5 GYPSUM BOARD PRODUCTS

A. General: Provide gypsum boards of type indicated in maximum lengths available to minimize end-to-end joints.
1. Thickness: Provide gypsum board in 5/8" thickness, unless otherwise indicated.

B. Gypsum Base for Veneer Plaster: ASTM C 588, of Regular Type, with tapered long edges as standard with manufacturer.

C. Gypsum Backing Board for Multi-Layer Applications: Gypsum backing board, ASTM C 442; or gypsum base, ASTM C 588; or gypsum wallboard, ASTM C 36, as recommended by manufacturer.

D. Products: Subject to compliance with requirements, provide one of the following products for Gypsum Base:
1. "Dens-Cote Plaster Base"; Georgia-Pacific Corp.
2. "Tapered Edge Kal-Kore Regular"; Gold Bond Building Products Div., National Gypsum Co.
3. "Imperial Gypsum Base"; United States Gypsum Co.
4. Or an Approved Equal.

2.6 TRIM ACCESSORIES

A. Provide corner beads, edge trim, and control joints which comply with ASTM C 1047 and veneer plaster manufacturer's recommendations.
1. Material: Formed sheet steel coated with zinc by hot-dip or electrolytic processes, or with aluminum.
2. Trim Shapes: Provide corner beads, casing beads and control joints of size and shape to suit field conditions.

2.7 JOINT REINFORCING MATERIALS

A. General: Provide joint reinforcing materials which comply with ASTM C 587 and are acceptable to veneer plaster manufacturer.

B. Joint Tape: Paper.

C. Embedding Material for Joint Tape: As recommended by veneer plaster manufacturer for use with joint tape material indicated.

D. Products: Subject to compliance with requirements, provide one of the following:
   1. Paper Joint Tape:
      a. "G-P Tape"; Georgia-Pacific Corp.
      b. "Tapers Choice"; Gold Bond Building Products Div., National Gypsum Co.
      c. "Perf-A-Tape Reinforcing Tape"; United States Gypsum Co.
      d. Or an Approved Equal.
   2. Embedding Material for Paper Joint Tape:
      a. "G-P Speed Set Joint Compound"; Georgia Pacific Corp.
      b. "Kal-Cote Base Plaster"; Gold Or A Bond Building Products Div., National Gypsum Co.
      c. "Durabond Joint Compound"; United States Gypsum Co.
      d. Or an Approved Equal.

2.8 VENEER PLASTER MATERIALS

A. Two-Component Regular Veneer Plaster: ASTM C 587, manufacturer's standard products consisting of separate veneer plaster formulations for base and finish coats for application over gypsum base.

B. Products: Subject to compliance with requirements, provide one of the following two- component regular veneer plasters:
   1. Products of Gold Bond Div., National Gypsum Co., Or an Approved Equal.
      Base Coat: "Kal-Kote Base Coat".
      Smooth Finish Coat: "Kal-Kote Smooth Finish".
      Textured Finish Coat: "Kal-Kote Texture Finish".
   2. United States Gypsum Co. Products, Or an Approved Equal.
      Base Coat: "Imperial Base Coat".
      Smooth Finish Coat: "Diamond Interior Finish".
      Textured Finish Coat: Job-Aggregated "Diamond Interior Finish".

2.9 MISCELLANEOUS MATERIALS

A. General: Provide auxiliary materials for veneer plaster construction which comply with referenced standards and the recommendations of veneer plaster manufacturer.

B. Bonding Compound for Interior Plastering: ASTM C 631.

C. Spot Grout: ASTM C 475, setting-type joint compound of type recommended for spot grouting hollow metal door frames.

D. Gypsum Base Screws: ASTM C 1002.

E. Asphalt Felt: ASTM D 226, Type I (No. 15).

F. Concealed Acoustical Sealant: Nondrying, non-hardening, non-skinning, non-staining, non- bleeding, gunnable sealant complying with requirement specified in Division 7 section “Joint Sealers”.

G. Sound Attenuation Blankets: Unfaced glass fiber blanket insulation to comply with ASTM C 665 for Type I, thickness to match stud depth as manufactured by USG; Or an Approved Equal.

2.10 VENEER PLASTER MIXES

A. Mechanically mix veneer plaster materials to comply with referenced veneer plaster application standard and with recommendations of veneer plaster manufacturer.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates which veneer plaster construction attaches to or abuts including preset hollow metal frames, cast-in-anchors, and structural framing, for compliance with installation tolerances and other conditions affecting veneer plaster. Proceed with installation after unsatisfactory conditions have been corrected.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

C. Radiant-Heat Gypsum Veneer Plaster Ceilings: Examine electric heating cables prior to application of veneer plaster to verify that cables are countersunk or, if surface mounted, do not sag below ceiling substrate and are securely attached and installed taut.

D. Masonry Substrates: Verify that mortar joints are struck flush.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Ceiling Anchorages: Coordinate installation of ceiling suspension system. Verify that anchorage provisions have been properly installed to support ceiling.

B. Concrete Preparation: Prepare monolithic concrete substrates for veneer plastering as follows:
1. Clean concrete to remove dust, loose particles, grease, compounds, and other foreign matter which could impair bond with bonding compound and plaster.
2. Remove protrusions greater than 1/8” and fill depressions greater than 1/4” with portland cement mortar. Allow to set and dry.
3. Apply bonding compound on dried concrete substrates to comply with bonding agent manufacturer’s directions.

3.3 INSTALLATION OF STEEL FRAMING, GENERAL

A. Steel Framing Installation Standard: Comply with ASTM C 754 and with ASTM C 844 requirements that apply to framing installation.

B. Install supplementary framing at terminations in the veneer plaster construction and for support of fixtures, accessories, and similar construction to comply with recommendations of veneer plaster manufacturer, or with "Gypsum Construction Handbook" published by United States Gypsum Co.

C. Isolate steel framing from building structure to prevent transfer of structural loading at locations indicated below:
   1. Where suspended ceilings abut building structure.
   2. Where partition and wall framing abuts overhead structure.

D. Do not bridge building expansion and control joints with steel framing; independently frame both sides of joints.

3.4 INSTALLATION OF CEILING AND SOFFIT SUSPENSION SYSTEMS

A. Preparation and Coordination: Coordinate installation of suspension systems with overhead structural systems to ensure that anchorage provisions will receive ceiling hangers in a manner that will develop their full strength and at required spacings.

B. Hanger Installation: Attach hangers to structure above ceiling to comply with ML/SFA "Specifications for Metal Lathing and Furring" and with referenced standards. Do not use metal deck tabs. Where structure above is not adequate to support suspension system attach suspension system to supplemental support system specified in Division 5.

C. Install suspension system components of sizes and spacings required by referenced lathing and furring installation standards. The following sizes are minimum. Increase sizes to accommodate loading as required by New York City Building Code.
   1. Hangers: Space hangers not over 4'-0" o.c. parallel with, and not over 3'-0" perpendicular to, direction of carrying and angles channels, unless otherwise indicated, and within 6" of carrying channel ends. Do not increase existing spacing at hangers at existing angles and channels.
   2. Carrying Channels: Space carrying channels not over 3'-0" o.c. with 4'-0" o.c. hanger spacing.
   3. Furring Channels: Space furring channels not over 16" o.c.

D. Installation Tolerances: Install suspension members level within 1/8 inch in 12 ft. as measured both lengthwise on each member and transversely between parallel members.

E. Wire-tie or clip furring members to main runners and to other structural supports as indicated.

3.5 STEEL FRAMING FOR WALLS

A. Install runners at floors, ceilings, and structural members where veneer plaster stud system abuts other construction.
   1. Where studs are installed directly against exterior walls, install asphalt felt strips between studs and wall.

B. Installation Tolerances: Install each steel framing and furring member within 1/8 inch from plane of faces of adjacent framing.

C. Unless otherwise indicated, extend partition framing full height to structure above suspended ceilings. Provide framing over doors and openings and frame around ducts in partitions above ceiling to provide support for gypsum base.

D. Terminate partition framing at suspended ceilings only where indicated.

E. Install steel studs and furring in sizes and at spacings indicated but not less than that required by referenced steel framing installation standards published by United States Gypsum Company and as required to comply with New York city Building Code requirements.

F. Frame door openings to comply with applicable recommendations of veneer plaster manufacturer. Attach vertical studs to door frames; install runner track at head and secure to jamb studs.
   1. Extend vertical jamb studs through suspended ceilings and attach to underside of structure above.
   2. Install cripple studs in runner track above door frame.

G. Frame openings other than door openings in same manner as door openings; and install framing below sills of openings to match framing above door heads.

3.6 APPLICATION OF GYPSUM BASE, GENERAL

A. Gypsum Base Application Standard: Comply with ASTM C 844.

B. Erection Tolerance: No more than 1/16-inch offsets between gypsum base faces, and 1/8 inch in 8’-0” for plumb, level, warp and bow.

C. Install sound attenuation blankets as indicated.

D. Locate end-butt joints away from center of walls and ceilings, and stagger not less than 24 inches in alternate courses.

E. Install gypsum base for ceilings to minimize the number of end-butt joints, and to avoid end joints in the central area of each ceiling.

F. Install gypsum base for walls to minimize the number of end-butt joints. At stairwells and similar high walls, install gypsum base horizontally with end joints staggered over studs.

G. Install gypsum base with face side out. Do not install imperfect, damaged or damp boards. Butt boards with not more than 1/16-inch open space between boards. Do not force into place.

H. Attach gypsum base to steel studs so that leading edge of each board is attached to open (unsupported) edge of stud flange first.

I. Attach gypsum base to supplementary framing and blocking provided for additional support at openings and cutouts.

J. Spot grout hollow metal door frames. Spot grout each jamb anchor clip just before inserting gypsum base into frame.

K. Form control and expansion joints in veneer plaster surfaces at locations indicated, with space between edges of gypsum base, prepared to receive trim accessories.

L. Cover both faces of steel stud partition framing with gypsum base in concealed spaces, except in chase walls which are braced internally.
   1. Except for sound, fire, or smoke ratings, scraps of not less than 8 sq. ft. area may be used where concealed.
   2. Fit gypsum base around ducts, pipes, and conduits.

M. Isolate perimeter of non-load-bearing veneer plaster partitions from the structure. Provide 1/4 inch to 1/2-inch space and trim edge with "U" bead edge trim. Seal joints with acoustical sealant.

N. Space fasteners in gypsum base to comply with referenced gypsum base application standard and manufacturer's recommendations.

3.7 METHODS OF GYPSUM BASE APPLICATION

A. Single-Layer Application: Install gypsum base in accordance with referenced standards and system manufacturer's requirements.

B. Double-Layer Application: Install gypsum backing board for base layer and gypsum base for face layer as follows:
   1. On ceilings apply base. Offset joints between layers at least 10 inches. Apply base layers at right angles to supports.
   2. On partitions and walls apply base layer and face layers vertically with joints of base layer over supports and face layer joints offset at least 10 inches with base layer joints.
   3. On Z-furring members apply base layer and face layer vertically, with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.

C. Single-Layer Fastening Methods: Apply gypsum boards to supports with screws spaced as required by manufacturer and as required to achieve the required fire resistance rating.

D. Double-Layer Fastening Methods: Apply base layer and face layer separately to supports with screws and as required to achieve the required fire resistance rating.

3.8 INSTALLATION OF TRIM

A. General: Where feasible, use same fasteners to anchor trim as required to fasten gypsum base. Fasten flanges to comply with veneer plaster manufacturer's recommendations.

B. Closely fit and align ends of trim.

C. Install metal corner beads at external corners of gypsum base.

D. Install metal edge trim at exposed or semi-exposed edges of gypsum base. Provide type with face flange

to receive joint compound.

1. Install L-type trim where veneer plaster abuts other work, and where edge is exposed, revealed, gasketed, or sealant-filled.
2. Install U-bead where indicated.
3. Install control joints at locations required by referenced gypsum base application standard, and not greater than 30 feet on center, unless otherwise indicated.

3.9 INSTALLATION OF JOINT REINFORCEMENT

A. Reinforce interior angles and flat joints in gypsum base with joint tape and embedding material to comply with referenced gypsum veneer plaster application standard and with veneer plaster manufacturer’s recommendations.

B. Gypsum Base: Reinforce interior angles and flat joints with joint tape and embedding material to comply with ASTM C 843 and with gypsum veneer plaster manufacturer's written recommendations.

C. Abuse-Resistant Base: Reinforce joints between abuse-resistant panels with joint tape and embedding material according to panel manufacturer's written recommendations.

D. Glass-Mat Interior Gypsum Board: Reinforce joints between moisture- and mold-resistant panels with joint tape and embedding material according to panel manufacturer's written recommendations.

E. Cementitious Backer Units: Reinforce joints between cementitious backer units with joint tape and embedding material according to unit manufacturer's written recommendations.

3.10 VENEER PLASTERING

A. Gypsum Veneer Plaster Application Standard: Apply gypsum veneer plaster to comply with ASTM C 843 and veneer plaster manufacturer’s directions.

B. Grout frames continuously where required for fire-resistance ratings; otherwise, spot-grout at each anchorage point.

C. Concealed Surfaces: Omit veneer plaster in the following areas where plaster will be concealed, but do not omit veneer plaster behind cabinets and other removable items:

1. Above suspended ceilings.
2. Behind or under permanent wall or ceiling finishes.

D. Base Coat Application

1. Over Gypsum Base: Embed tape, fill beads, and allow plaster to set; then scratch and immediately double back to a thickness of 1/16” in accordance with the manufacturer’s printed directions.
2. Over Monolithic Concrete: Apply plaster bonding agent to concrete surfaces in a continuous film according to manufacturer’s recommendations. Concrete shall be free of dirt, grease, wax, oil, or other unsound surface conditions. Laitance, efflorescence and releasing agents shall be chemically removed. Apply plaster base coat by firmly grinding a thin coat into the bonding agent. Immediately double back to a completed thickness of 1/16” leaving a level surface ready for finish coat application.

E. Finish Coat Application

1. Apply to basecoat by scratching in tight and doubling back to a uniform surface and thickness

of 1/16". Remove trowel marks and surface imperfections by drawing- up or laying-down surfaces with light trowel pressure when plaster has stiffened. Water trowel to density and polish surface."

F. Provide smooth-trowel finish, unless otherwise indicated.

G. Grounds: Where frames and other units in the veneer plaster act as grounds (not including trim accessories) for flush plaster, groove finish coat at juncture with the other work.

3.11 CLEANING

A. Remove temporary coverings used to protect other work.

B. Remove plaster spillage promptly from other adjoining work.

C. Repair surfaces which have been damaged by plastering work.

3.12 PROTECTION

A. Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures veneer plaster work being without damage or deterioration at time of Substantial Completion.

B. Protect installed gypsum veneer plaster from damage from weather, condensation, construction, and other causes during remainder of the construction period.

C. Remove and replace gypsum veneer plaster and gypsum base panels that are wet, moisture damaged, or mold damaged.
1. Indications that gypsum base panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that gypsum base panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

3.13 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

END OF SECTION 092613

SECTION 092900
GYPSUM DRYWALL

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the Contract Documents.

B. Work Included: Provide gypsum board assemblies in accordance with the Contract Documents. The Contractor shall furnish and install all labor, materials and equipment necessary to complete all rough and finish carpentry work and related work incidental thereto as required by the drawings and specified therein. The Work of this Section shall include but not be limited to the following:
1. Steel framing members to receive gypsum board.
2. Gypsum board screw-attached to steel framing and furring members.
3. Glass mesh mortar units for application of tile.

C. Related Work Specified Elsewhere
1. Section 024119- Demolition and removal of selected portions of buildings and site elements.
2. Section 078100- Applied Fireproofing.
3. Section 092613 – Gypsum Veneer Plastering.
4. Section 099101- Paint Removal.
5. Firestopping is specified in Section 078413 “Firestops and Smokeseals”.
6. Sealants and joint fillers other than specified herein installed at interface of gypsum board assemblies and other building components are specified under Section 079200 “Joint Sealants”.
7. Finish painting of gypsum wallboard assemblies is specified in Section 099000 "Painting."
8. Steel door frames- Section 081113.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the gypsum drywall as shown on the drawings and/ or specified herein, including, but not limited to, the following:
1. Gypsum board work for partitions, ceilings, column enclosures, furring, and elsewhere where gypsum drywall work is shown on drawings.
2. Metal supports for gypsum drywall construction.
3. Acoustical insulation for gypsum drywall work.
4. Sealant for gypsum drywall work.
5. Concealed metal reinforcing for attachment of railings, toilet partitions and other items supported on drywall partitions and walls.
6. Taping and finishing of drywall joints.
7. Installing rings and frames in drywall surfaces for grilles, registers, and lighting fixtures.
8. Gypsum wallboard cants at beams and other projections over 2" deep in elevator shafts where adjoining wall is of gypsum wallboard construction.
9. Gypsum shaft wall construction.
10. Bracing and connections.

1.3 REFERENCES

A. Basis of Design: When particular manufacturers' materials, products or processes are specified for an item of Work, any one thereof is acceptable for the Subcontractor to choose. An alternative material, product or process will be considered if the Subcontractor submits a written substitution request together with such information as may be necessary to assist the Consultant in determining whether the proposed substitution is acceptable, the burden of proof rests solely upon the Subcontractor.

B. The following standards, as well as other standards which may be referred to in this Section, shall apply to the work of this Section:
   1. The Gypsum Construction Handbook, latest edition, USG.
   2. ASTM C 645 "Standard Specification for Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board."
   3. ASTM A 568 "Standard Specification for Steel, Sheet, Carbon, and
   4. High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements For."
   5. ASTM 1396 "Standard Specification for Gypsum Board."
   6. ASTM C 475 "Standard Specification for Joint Treatment Materials for Gypsum Wallboard Construction."
   7. ASTM C 645 "Specification for Non-Structural Steel Framing Members."
   8. ASTM C 754 "Standard Specification for Installation of Steel Framing Members to Receive Screw Attached Gypsum Panel Products".
   9. ASTM C 840 "Standard Specification for Application and Finishing of Gypsum Board."
   10. ASTM C 919 "Standard Specification for Use of Sealants in Acoustical Applications."
   11. ASTM C 954 "Standard Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs From 0.033 in. to 0.112 in. in Thickness."
   12. ASTM C 1002 "Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Board."
   13. ASTM C 754 "Standard Specification for Installation of Steel Framing Members to Receive Screw Attached Gypsum Board Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs."
   14. ASTM D 3273 "Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber."
   15. ASTM C 1177 "Specification for Glass Mat Gypsum Substrate for Use at Sheathing."
   16. ASTM C 1178 "Specification for Glass Mat Water Resistant Gypsum Backing Board."
   17. ASTM C 1278 "Specification for Fiber Reinforced Gypsum Panels."
   18. ASTM C 11 definitions of terms for gypsum board construction.

C. Allowable Tolerances: 1/32" offsets between planes of board faces, and 1/16" in 8'-0" for plumb, level, warp, and bow.

D. Fire-Resistance Rating: Where gypsum drywall with fire resistance ratings are indicated, provide materials and installations which are identical with those of applicable assemblies tested per ASTM E 119 by fire testing laboratories, or to design designations in UL "Fire Resistance Directory" or in listing of other testing agencies acceptable to authorities having jurisdiction, and compliant with UL Test #2079; criteria for cycle movement for all field height wall sections requiring allowance for vertical deflection within framing details.

E. Installer: Firm with not less than 5 years of successful experience in the installation of specified materials.

F. Gypsum board shall have 98% recycled content, mostly post-industrial.

G. Acoustic insulation shall have a minimum of 30%- 40% post-consumer recycled content.

1.4 SYSTEM DESCRIPTION

A. Performance Requirements: For information only. Partition schedule and locations are shown on the drawings.
   1. Stair Enclosures: Comply with New York City Section 32-05 of Chapter 32 of Title 1 of the Official Compilation of the Rules of the City of New York regarding “Impact Resistant Stair and Elevator Enclosures” when such enclosures are of drywall construction as follows:
      a. The stair gypsum board enclosure assemblies shall have a minimum two (2) hour fire resistance rating as tested in accordance with ASTM E119.
      b. The stair gypsum board enclosure assemblies shall be sheathed with 2 layers of gypsum board (base layer of impact resistance board) and shall meet or exceed Soft Body Impact Classification Level 2 (100 ft.-lbs) impact resistance as tested in accordance with ASTM C1629. Comply with assembly requirements in terms of stud size and gage, spacing of studs and fasteners, and securement of wall assemblies to structural components.
      c. All outer layers of drywall partitions exposed to view in all interior spaces (floor to ceiling) shall be sheathed with at least 1 layer of impact resistance gypsum wall board and shall meet or exceed Soft Body Impact Classification Level 2 (100 ft.-lbs) impact resistance as tested in accordance with ASTM C1629. Comply with assembly requirements in terms of stud size and gage, spacing of studs and fasteners, and securement of wall assemblies to structural components.

B. Sound Characteristics for Assemblies: For gypsum board system with STC ratings, provide materials and construction identical to those of assemblies whose STC ratings were determined according to ASTM E90 and classified according to ASTM E413 by a qualified independent testing agency.

1.5 SUBMITTALS

A. Submit shop drawing for each drywall partition, furring and ceiling system showing size and gauges of framing members, hanger and anchorage devices, wallboard types, insulation, sealant, methods of assembly and fastening, control joints indicating column lines, corner details, joint finishing and relationship of drywall work to adjacent work. Submit for Consultant’s action. Submit shop drawings for the fabrication and installation of the Work. Prepare details at not less than 3 in. = 1 ft. minimum as follows:
   1. Details of unusual conditions in connection with gypsum board system construction.
   2. Proposed locations of control joints that are required but not shown.
   3. Locations of access doors occurring in gypsum board system construction.
   4. Details of attachment to primary ceiling supports.
   5. Details of typical and atypical interior soffit construction.
   6. Details of rated assemblies with copies of their respective approvals. Coordinate with Division 07 "Firestopping" to provide combined submittals for partition head details and penetration details at rated partitions.

B. Test Reports: This Contractor shall submit test report, obtained by drywall manufacturer, indicating conformance of drywall assemblies to required fire ratings and sound ratings.

C. Samples: Each material specified herein, 12" x 12", or 12" long, or in manufacturer's container, as applicable for type of material submitted.

D. Manufacturer's Literature: Submit technical and installation instructions for each drywall partition, furring and ceiling system specified herein, and for each fire-rated and sound-rated gypsum board assembly. Submit other data as required to show compliance with these specifications, including data for mold and moisture resistant joint compound.

E. Test Reports: This Contractor shall submit test report, obtained by drywall manufacturer, indicating conformance of drywall assemblies to required fire ratings and sound ratings.

1.6 PRODUCT HANDLING AND PROTECTION

A. Deliver, store and handle drywall work materials to prevent damage. Deliver materials in their original, unopened containers or bundles, and store where protected from moisture, damage and from exposure to the elements. Store wallboard in flat stacks.

B. Protect wallboard from becoming wet.

C. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.

D. Handle gypsum boards to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

1.7 ENVIRONMENTAL CONDITIONS

A. Project Conditions: Establish and maintain project conditions for applying and finishing gypsum board to comply with ASTM C840 requirements or gypsum board manufacturer's recommendations, whichever are more stringent.

B. Temperature Limitations: Installation of gypsum board joint treatments shall not start when outside temperature is below 55 deg. F., unless building is enclosed and heated to maintain a continuous and uniform temperature of not less than 55 deg. F., from one week prior to beginning of joint treatment until joint treatment is completed and thoroughly dry. Ventilation, either natural or supplied by fans, circulators or air conditioning systems shall be provided to remove excess moisture during joint treatment. Temperature requirements may be waived only on recommendation of gypsum board materials manufacturer. Space above suspended ceilings shall be vented sufficiently to prevent temperature and pressure build up. Installation shall not start until windows are glazed and doors are installed unless openings are temporarily closed.

1.8 QUALITY ASSURANCE

A. Basis of Design: When a specific manufacturers’ materials, products or processes are specified for an item of Work, any one thereof is acceptable for the Subcontractor to choose. An alternative material, product or process will be considered if the Subcontractor submits a written substitution request together with such information as may be necessary to assist the Consultant in determining whether the proposed substitution is acceptable, the burden of proof rests solely upon the Subcontractor.

B. Sole Source

1. Single Source Responsibility for Steel Framing: Obtain steel framing members for gypsum board systems from a single manufacturer acceptable to the gypsum board system manufacturer. Steel framing and related accessories shall be manufactured by a current member of the Steel Stud Manufacturers Association.
2. Single Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.
3. Single Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board systems and other panel products or from a manufacturer acceptable to gypsum board system manufacturer.

C. Installer Qualifications: The gypsum board work shall be performed by a firm having five (5) years' experience in the application of gypsum board systems on projects similar in size and scope to this Project.

D. The Contractor shall perform all cutting and fitting required to complete the work of the contract and to accommodate the work of all other trades. All cutting and fitting shall be neatly and accurately done, all members shall be securely fastened in place. All finished surfaces shall be free of tool marks or open joints.

E. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from such authorities.
1. Requirements of Regulatory Agencies: Wherever a fire resistance classification is shown involving gypsum board systems (3-hr., 2-hr. and similar designations), provide materials, accessories and application procedures which have been listed by UL or tested according to ASTM E119 to achieve the rating required.
2. Provide materials for fire rated assemblies, including framing, accessories, and fasteners, produced by one manufacturer, or, when products of more than one manufacturer are utilized in a rated system, they shall be acceptable to authorities having jurisdiction.

1.9 JOB MOCK-UP

A. Visual Mockups: After approval of samples and sample panel(s), and prior to commencement of the Work, provide a visual mock-up, of not less than 100 ft.2 of each type of gypsum drywall and drywall finish, including at least one control joint, to demonstrate aesthetic effects of finishes as well as qualities of materials and execution. Simulate finished lighting conditions for review of in-place unit of Work. Mock-up shall be representative of the finished Work in all respects.

B. Build visual mockups to comply with the following requirements, using materials indicated for final unit of Work. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by consultant. Demonstrate the proposed range of aesthetic effects and workmanship. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

C. At a suitable location, where directed by the Architect, lay up a portion of a finished wall and ceiling demonstrating the quality of work, including finishing, to be obtained under this Section. Omit drywall boards in locations as directed by the Architect to show stud spacing and attachments, after acceptance, complete assembly.

D. Adjust the finishing techniques as required to achieve the finish required by the Architect as described

in this Section of these specifications.

E. Upon approval of the mock-up, the mock-up may be left in place as a portion of the finished work of this Section.

F. All drywall work shall be equal in quality to approved mock-up.

PART 2- PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers for Gypsum Drywall Panels and Accessories: Materials specified below, unless noted otherwise or specified herein, are those of U.S. Gypsum Co. Equivalent materials of National Gypsum Co., Georgia Pacific and Lafarge meeting specification requirements are acceptable; Or an Approved Equal.

B. Acceptable Manufacturers for Metal Supports of Drywall Assemblies: Unless otherwise noted, provide products manufactured by Dietrich Metal Framing, Super Steel Building Products, Marino/Ware, Super Steel Studs, Clark Western; Or an Approved Equal.

2.2 METAL SUPPORTS

A. Metal Floor and Ceiling Runners
1. Channel Type: Formed from 20 U.S. Std. gauge (unless otherwise noted) galvanized steel, width to suit channel type metal studs. Use 20 ga. top runners with 1-1/4" minimum flanges.
2. Ceiling runners and head of wall connections at rated partitions shall conform to UL #2079 for cycle movement. Provide positive mechanical connection of framing to structure, allowing for vertical movement within connections. Minimum of 20 ga. galvanized steel for clips, 20 ga. galvanized steel for ceiling runners. Providing a friction free – anti-seizure movement capacity.
   a. As manufactured by the Steel Network, VertiClip or VertiTrack; Or an Approved Equal, made by Metal-Lite Inc.
   b. FireTrak (including stud clips) by FireTrak Corp; Or an Approved Equal, made by Metal-Lite Inc.
   c. "J" Type: Formed from 20 U.S. Std. gauge galvanized steel, 1" x 2-1/2" or 4" wide (to suit detail) x 2-1/4" (for shaft wall).

B. Metal Studs, Framing and Furring
1. Channel Type Studs: Channel type with holes for passage of conduit formed from minimum 20 U.S. Std. gauge (unless heavier gauge is required to meet deflection limits) galvanized steel, width as shown on drawings.
2. Furring Channels: Hat shaped, formed from galvanized steel, 20 U.S. Std. gauge.
3. "C-H" Type Stud: 1-1/2" x 2-1/2", 4" or 6" wide (to suit detail) galvanized steel. Use for shaft wall construction.
4. Double "E" Type Stud: 2" x 2-1/2", 4" or 6" wide (to suit detail) galvanized steel. Use for shaft wall construction.
5. Continuous 16-gauge x 8" wide steel wall plate screwed to studs as required for support of railings, toilet partitions and other items supported on drywall partitions and walls.
6. Acoustic Resilient Channel: 1-1/2” by Kinetics.

7. Continuous 48” high 20-gauge sheet metal reinforcing attached to studs as required from 4’-0” AFF for support of wall mounted shelves on drywall partitions and walls.
8. Z-Furring Members: Manufacturer’s standard zee-shaped furring members with slotted or non-slotted web, fabricated from hot-dip galvanized steel sheet complying with ASTM A 525, Coating Designation G60; with a minimum base metal (un-coated) thickness of 0.0179-inch, face flange of 1-1/4 inch, wall- attachment flange of 7/8 inch, and of depth required to fit insulation thickness indicated.
9. Fasteners: Provide fasteners of type, material, size, corrosion resistance, holding power and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum drywall manufacturers for applications indicated.

C. Suspended Ceiling and Fascia Supports
1. General: Size metal ceiling supports to comply with the following, unless otherwise indicated or required by New York City Building Code.
2. Wire for Ties: ASTM A 641, 18 gauge minimum, Class 1 zinc coating, soft temper.
3. Main Runners: 1-1/2" steel channels, cold rolled at 0.475 lbs. per ft., rust-inhibitive paint finish.
4. Furring Members: Screw-type hat-shaped furring channels of 20 ga. zinc-coated steel; comply with ASTM C 645.
5. Rod or Flat Hangers: Mild steel, zinc or cadmium coated, 1/4” rods unless otherwise shown pr required to meet code requirements. Flat hangers: min. 3/16” x 1” mild steel, galvanized per ASTM A 123.
6. Hanger Anchorage Devices: Screws, clips, bolts or other devices applicable to the indicated method of structural anchorage for ceiling hangers. Provide anchorage devices sized for five (5) times the calculated load supported. Provide devices appropriate for anchorage to the structure whose suitability has been proven through certified test data, and as follows:
   a. General: Size devices to develop full strength of hanger but not less than 3 times calculated hanger loading, except size direct pull-out concrete inserts for 5 times the calculated hanger loading. All hanger anchorage shall support a minimum of 200 pounds dead load.
   b. Concrete Slabs- 4” Minimum: Provide drilled expansion type anchors of size to suit the load.
   c. Provide appropriate code approved hangers where other support conditions exist.
7. Strap Iron Hanger Inserts: Mild steel flats hot dip galvanized or with manufacturer’s standard rust inhibiting coating, 1 in. x 3/16 in. with 7/16 in. dia. holes punched on center line and lower ends, designed to develop the full strength of hangers.
8. Hangers: Galvanized, one of the following:
   a. 3/16 in. x 1 in. steel straps.
   b. ASTM A510; 1/4 in. diameter mild carbon steel rods.
9. Furring Anchorages: 16 ga. galvanized wire ties, manufacturer's standard clips, bolts or screws as recommended by furring manufacturer.
10. General: Size and provide ceiling support components to comply with ASTM C754.
    a. For NYC projects comply with Referenced Standard RS 5-16 of the NYC Building Code.
11. Carrying Channels: ASTM C754, cold rolled steel channels, 1-1/2 in, 414 lbs. per 1000 linear ft.
12. Clips: Provide support clips, clamps, fasteners, and other attachment devices as required to connect components and transfer imposed loads of primary suspension system.

D. All galvanized steel members shall have coating conforming to ASTM A 653, G-60.

E. Corner Angles and Elevator Jamb Struts: Formed galvanized steel sheet angles, size and gauge as recommended by the gypsum board manufacturer for the wall system indicated.

F. Ties: Comply with the requirements of Underwriters' Laboratories, Inc., and the gypsum board manufacturer for the following types.
1. ASTM C754, 18-gauge tie wire.
2. 1/2 in. wide x 0.015 in. thick steel strapping.

G. Shaft Wall: Components as required to provide fireproof assemblies for the hourly rating shown or required and complying with UL listing.

2.3 GYPSUM WALLBOARD MATERIALS

A. Gypsum Wall Board: 1/4”, 1/2" thick and 5/8" thick as indicated on drawings, "Sheetrock," 48" wide, in maximum lengths available to minimize end-to-end butt joints.

B. Fire Rated Gypsum Wall Board: 1/2" thick and 5/8" thick as indicated on drawings, "Sheetrock Firecode C," 48" wide, in maximum lengths available to minimize end-to- end butt joints.

C. Water Resistant Backing Board for Tile Finish: 1/2" thick and 5/8" thick, 3' x 6', "Durock Tile Backer Board" or "Dens-Shield Tile Backer Board" by Georgia Pacific. Cover joints with a pressure sensitive woven glass fiber tape equal to Imperial Type P Tape.

D. Water Resistant Gypsum Wall Board (for areas in toilet rooms, lockers, janitor's closets not scheduled to receive ceramic tile, or where fire rating is required): 1/2" thick and 5/8" thick as indicated on drawings, "Mold Tough" or "Mold Tough FR," 48" wide, in maximum lengths available to minimize end-to-end butt joints.

E. Shaft Wall Liner: Solid gypsum board liner for shaft wall construction, 1" thick, 24" wide, as required to suit condition, by standard lengths as required, beveled edges. Provide "Mold Tough Liner Panel" or "DensGlass Ultra Shaft Guard" by Georgia Pacific; Or an Approved Equal.

F. Gypsum Wallboard: ASTM C 36, and as follows:
1. Type: Type X for fire-resistance-rated assemblies
2. Edges: Tapered
3. Thickness: 5/8 inch, unless otherwise indicated.
4. Available Products: Subject to compliance with requirements, products which may be incorporated in the Work where Type X gypsum wallboard is indicated include, but are not limited to, the following:
   a. “Gyprock Fireguard ‘C’ Gypsum Board”; Domtar Gypsum Co.
   b. “Fire-Shield G”; Gold Bond Building Products Div., National Gypsum Co.
   c. “SHEETROCK Brand FIRECODE ‘C’ Gypsum Panels”; United States Gypsum Co.
   d. Or an Approved Equal.

G. Gypsum Backing Board for Multi-Layer Applications: ASTM C 442 or, where backing board is not available from manufacturer, gypsum wallboard, ASTM C 36, and as follows:
1. Type: Type X for fire-resistance-rated assemblies.
2. Edges: Manufacturer’s standard.

3. Thickness: 5/8 inch, unless otherwise indicated

H. Abuse Resistant Gypsum Board: ASTM C1629 Class 3 , 5/8 in. thick unless otherwise shown or specified, specifically manufactured to produce greater resistance to surface indentation and through penetration than standard gypsum board panels; provide one of the following.
1. Hi-Abuse XP Wallboard" (National Gypsum Company)
2. "Fiberock Brand Panel VHI Abuse Resistant" (United States Gypsum Co.)
3. “ToughRock Abuse-Resistant Gypsum Board” (G-P Gypsum Corporation)
4. "Dens Armor Plus Abuse Guard" by Georgia Pacific
5. Or an Approved Equal.

2.4 FASTENERS

A. Metal Framing to Structure: Power driven fasteners providing not less than 200 lbf. pull-out strength and 700 lbf. shear strength.

B. Steel Drill Screws for Gypsum Board Systems: ASTM C1002, Type G, Type S, or Type W screws, and suitable for fastening into steel not greater than 20-gauge thickness. ASTM C954, for fastening into steel of 20 gauge to 12-gauge thickness. Pan head for metal-to-metal connections. Bugle head for fastening gypsum board.

C. Concrete and Masonry: For securing to concrete or masonry use 9 gauge case-hardened and quenched steel nails of sufficient length to provide permanent fastening.

D. Other Applications: For other applications involving gypsum board comply with gypsum board manufacturer's printed recommendations.

E. Fasteners for Cementitious Board: For fastening cementitious backer units use corrosion resistant coated steel drill screws of size and type recommended by board manufacturer.

2.5 GLASS MESH MORTAR UNITS

A. Provide cementitious backer units complying with ANSI A118.9, of thickness and width indicated below, and in maximum lengths available to minimize end-to-end butt joints and complying with the following requirements:
1. Coated Gypsum Panels: Gypsum core with glass fiber mesh surface mats and manufacturer’s proprietary water and vapor retarding coating on both faces, fabricated in panels 1/2 inch thick by 48 inches wide by 96 inches long, and weighing 2.0 lbs per sq. ft.

2. Cement-Coated Portland Cement Panels: High density Portland cement surface coating on both faces and lightweight concrete core composed of Portland cement and expanded ceramic aggregate; fabricated in panels 7/16 inch thick by 36 inches wide by 36, 48, or 60, 64, or 72 inches long; and weighing 3.2- 3.8 lbs per sq. ft.
3. Vinyl-Coated Portland Cement Panels: Core formed in a continuous process from aggregated Portland cement slurry and reinforced with vinyl-coated woven glass fiber mesh embedded in both surfaces, with one face smooth and other textured; fabricated in panels 1/2 inch thick and by 36 inches wide by 48, 60, and 72 inches long; and weighing 3 lbs per sq. ft.

B. Available Products: Subject to compliance with requirements, glass mesh mortar units which may be incorporated in the Work include, but are not limited to, the following:

1. “Dens-Shield”; Georgia Pacific Corp.
2. “Wonder-Board”; Modulars Inc.
3. “N Tile Backer Board”; Durabond Div., USG Industries, Inc.
4. Or an Approved Equal.

C. Where boards are part of a fire rated assembly, provide boards that are approve for the required fire resistance rating assembly.

2.6 ACCESSORIES

A. Acoustic Insulation: Paper-less, non-combustible, semi-rigid mineral fiber mat, 2" thick, in walls (unless otherwise indicated), 3 lb./cu. ft. maximum density; Thermafiber LLC; "Thermafiber," Or an Approved Equal.

B. Fasteners for Wall Board: USG Brand Screws; Type S Bugle Head for fastening wallboard to lighter gauge interior metal framing (up to 20 ga.). Type S-12 Bugle Head for fastening wallboard to heavier gauge interior metal framing (20 ga. to 12 ga.); Type S and Type S-12 Pan Head for attaching metal studs to door frames and runners; and Type G Bugle Head for fastening wallboard to wall board. Lengths specified below under "Part 3- Execution" Articles and as recommended by drywall manufacturer.

C. Laminating Adhesive: "Sheetrock Brand Joint Compound."

D. Metal Trim- Edge Beads: "Sheetrock Brand Paper Faced Metal Bead and Trim."

E. Metal Trim Treatment Materials and Joint Treatment Materials for Gypsum Drywall Boards: Paper tape for joint reinforcing; Setting Type (Durabond 90) or Lightweight Setting Type Joint Compound for taping and topping; and Ready-Mix Compound for finishing.

F. Control Joints: No. 0.093, USG

G. Acoustical Sealant: USG "Acoustical Sealant" or "Tremco Acoustical Caulking" of Tremco Mfg. Co., Or an Approved Equal.

H. Neoprene Gaskets: Conform to ASTM D 1056.

I. Floating Ceiling Knife Edge: FCT-TF by Pittco, factory primed aluminum alloy.

2.7 TRIM ACCESSORIES

A. Cornerbead, stops, edge trim, “J” beads and similar trim members shall be metal, No. 20 U.S. Gauge, galvanized or cadmium plated, and roll formed for proper shape, or an approved equal, to USG “Durabead” with 1-1/4” x 1-1/4” flange. For Interior Installation: Provide corner beads, edge trim and control joints which comply with ASTM C 1047 and requirements indicated below.
   a. Material: Formed metal, complying with the following requirement.
      1) Sheet steel zinc-coated by hot-dip process.
      2) Sheet steel coated with zinc by hot-dip or electrolytic processes, or with aluminum.
   b. Edge trim shapes indicated below by reference to designations of Fig. 1 in ASTM C 1047.

1) "LC" Bead, unless otherwise indicated.
2) "LK" Bead with square nose for use with kerfed jambs.
3) "L" Bead where indicated.
4) "U" Bead where indicated.

c. One-Piece Control Joint: Formed with vee-shaped slot per Fig. 1 in ASTM C 1047, with slot opening covered with removable strip.
d. All inside corners shall be reinforced tape. Reinforcing tape shall be "Perf- A-Tape" reinforcing tape, spark perforated and with beveled edges, or an approved equal.

2.8 AUXLIARY ACCESSORIES

A. Joint Treatment Materials: Provide joint treatment materials complying with ASTM C475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application shown.
1. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise shown. Use pressure sensitive or staple attached open weave glass fiber reinforcing tape with compatible joint compound where recommended by manufacturer of gypsum board and joint treatment materials for application indicated.
2. Joint Tape for Cementitious Backer Units: Polymer coated, open glass fiber mesh.
3. Drying Type Joint Compounds for Gypsum Board: Factory packaged and mixed vinyl based ready mix formulation.
4. Joint Compound for Cementitious Backer Unit: Material recommended by cementitious backer unit manufacturer.
5. Tape for Foil Faced Gypsum Board: Pressure sensitive tape of type recommended by foil faced gypsum board manufacturer for sealing joints and penetrations in foil faced gypsum board.

B. Laminating Adhesive: Special adhesive or joint compound recommended for laminating gypsum base panels to face panels in multilayer construction.
1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Spot Grout: ASTM C475, setting type joint compound recommended for spot grouting hollow metal door frames.

D. Water: Clean and free of deleterious material.

E. Concealed Acoustical Sealant: Non-drying, non-hardening, non-skinning, non-staining, non- bleeding, gunnable sealant complying with requirement specified in Division-7 section "Joint Sealers." Fire retardant caulking to be installed where applicable.

F. Sound Attenuation Blankets: Un-faced mineral fiber blanket insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing); and as follows.

G. Mineral Fiber Type: Fibers manufactured from glass.

H. Glass Mesh Mortar Unit Finishing Materials: Tape and joint compounds as recommended by glass mesh mortar unit manufacturer.

I. All other materials, not specifically described but required for a complete and proper installation of steel studs, shall be new, first quality of their respective kind, in strict accordance with the recommendations of the manufacturer of the metal studs used and subject to the approval of the Architect.

PART 3- EXECUTION

3.1 GENERAL

A. Manufacturer's Instructions: Prepare substrates and install the work of this Section, including components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

3.2 INSPECTION

A. Examine substrates to which drywall construction attaches or abuts, preset hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of drywall construction. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine the areas and conditions where gypsum drywall is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

C. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Subcontractor shall remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.3 PREPARATION

A. Ceiling Anchorages: Coordinate installation of ceiling suspension system with installation of overhead structural systems to ensure that inserts and other structural anchorage provisions have been installed to receive ceiling anchors in a manner that will develop their full strength and at spacing required to support ceiling.

B. Before sprayed-on fireproofing is applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed-on fireproofing. Where offset anchor plates are required provide continuous units fastened to building structure not more than 24 inches o.c. and to ceiling runners.

C. After sprayed-on fireproofing has been applied, remove only as much fireproofing as needed to complete installation of drywall construction. Protect fireproofing that remains from damage.

3.4 GENERAL INSTALLATION REQUIREMENTS

A. General

1. Gypsum Board: Install gypsum board and accessories in accordance with ASTM C840, unless otherwise shown or specified. Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels.
2. Install drywall work in accordance with drywall manufacturer's printed instructions and as indicated on drawings and specified herein.
3. All metal framing for drywall partitions shall extend from floor to underside of structural deck above. Provide for vertical deflection with positive mechanical connections of framing members to structure.
4. Provide concealed reinforcement, 16 ga. thick by eight (8) inches wide or as detailed or as recommended by manufacturer, for attachment of railings, toilet partitions, and other items to be supported on the partitions which cannot be attached to the metal framing members. Concealed reinforcement shall span between metal studs and be attached thereto using two (2) self-tapping pan head screws at each stud.
    a. Back of drywall shall be scored or notched to prevent bulging out where reinforcement plate occurs.
5. Sprayed-on-Fireproofing: If sprayed on fireproofing has been applied, remove only as much fireproofing as needed to complete installation of gypsum board construction. Protect fireproofing that remains from damage.
6. Fill and tape all joints.
7. Multiple Layer Applications: Stagger, seal and tape successive gypsum board layers. Secure all layers to framing members with screws.
8. Tolerances: Install partitions with the following maximum gaps between gypsum board and abutting construction: Floor – 1/8 inch, Masonry or concrete walls – 1/8 inch, Underside of slab or decking – 3/8 inch.

B. Fire-Rated Assemblies: Install fire-rated assemblies in accordance with requirements of authorities having jurisdiction, Underwriters' Laboratories and test results obtained and published by the drywall manufacturer, for the fire-rated drywall assembly types indicated on the drawings.

C. Acoustic Assemblies: Install acoustic rated assemblies to achieve a minimum STC as noted on drawings, in accordance with test results obtained and published by the drywall manufacturer, for the drywall assembly type indicated on the drawings.

D. Sealant
1. Install continuous acoustical sealant bead at top and bottom edges of wallboard where indicated or required for sound rating as wallboard is installed, and between metal trim edge beads and abutting construction.
2. Install acoustical sealant in 1/8" wide vertical control joints within the length of the wall or partitions, and in all other joints, specified below under "Control Joints." Install bead of acoustical sealant around electric switch and outlet boxes, piping, ducts, and around any other penetration in the wallboard; place sealant bead between penetrations and edge of wallboard.
3. Where sealant is exposed to view, protect adjacent surfaces from damage and from sealant material, and tool sealant flush with and in same plane as wallboard surface. Sealant beads shall be 1/4" to 3/8" diameter.

E. Wall Board Application
1. Do not install wallboard panels until steel door frames are in place; coordinate work with Section 081113, "Steel Doors and Frames."
2. See drawings for all board types. Use fire-rated wallboard for fire-rated assemblies. Use water-

resistant wallboard where indicated on drawings and where wallboard would be subject to moisture. Install water-resistant wallboard in full, large sheets (no scraps) to limit number of butt joints.

3. Apply wallboard with long dimension parallel to stud framing members, and with abutting edges occurring over stud flanges.
4. Install wallboard for partitions from floor to underside of structure above and secure rigidly in place by screw attachment, unless otherwise indicated.
5. Provide "Thermafiber" safing insulation meeting standards of Section 078413 at flutes of metal deck where partitions carry up to bottom of metal deck.
6. Neatly cut wallboard to fit around outlets, switch boxes, framed openings, piping, ducts, and other items which penetrate wallboard; fill gaps with acoustic sealant.
7. Where wallboard is to be applied to curved surfaces, dampen wallboard on back side as required to obtain required curve. Finish surface shall present smooth, even curve without fluting or other imperfections.
8. Screw fasten wallboard with power-driven electric screw driver, screw heads to slightly depress surface of wallboard without cutting paper, screws not closer than 3/8" from ends and edges of wallboard.
9. Where studs are doubled-up, screw fasten wallboard to both studs in a staggered pattern.

F. Cement Backer Board
1. General: Furnish cementitious backer board in maximum available lengths. Install horizontally, with end joints over framing members.
2. Fastening: Secure cementitious backer board to each framing member with screws spaced not more than 12 inches on center and not closer than 1/2" from the edge. Install screws with a conventional screw gun so that the screw heads are flush with the surface of the board.
3. Joint Treatment: Fill space between edge of backer and receptor with dry-set Portland cement or latex-Portland cement mortar. Fill all horizontal and vertical joints and corners with dry-set Portland cement or latex-Portland cement mortar. Apply fiberglass tape over joints and corners and embed with same mortar.

G. Metal Trim: Install and mechanically secure in accordance with manufacturer's instructions; and finish with three (3) coats of joint compound, feathered and finish sanded smooth with adjacent wallboard surface, in accordance with manufacturer's instructions.
1. Corner Beads: Install specified corner beads in single lengths at all external corners unless corner lengths exceed standard stock lengths.
2. Edge Beads: Install specified edge beads in single lengths at all terminating edges of wallboard exposed to view, where edges abut dissimilar materials, where edges would be exposed to view, and elsewhere where shown on drawings. Where indicated on drawings, seal joint between metal edge bead and adjoining surface with specified gasket, 1/8" wide minimum and set back 1/8" from face of wallboard, unless other size and profile indicated on drawings.
3. Casing beads shall be set in long lengths, neatly butted at joints. Provide casing beads at juncture of board and vertical surfaces and at exposed perimeters.
4. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim is indicated. Provide type with face flange to receive joint compound except where “U” bead (semi-finishing type) is indicated.
    a. Install “LC” bead where drywall construction is tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
    b. Install “LK” bead where substrate is kerfed to receive long flange of trim.
    c. Install “L” bead where edge trim can only be installed after gypsum board is installed.
    d. Install U-type trim where edge is exposed, revealed, gasketed, or sealant-filled

(including expansion joints).

H. Acoustical Accessories
1. Acoustical Sealant: Non-hardening, permanently resilient acoustic sealant. Use fire rated acoustical sealant where required to maintain both acoustic and fire performance. Use continuous beads of acoustical sealant to seal assemblies at the head, sill, perimeter, and penetrations of acoustically critical gypsum board constructions. Acceptable approved equal Manufacturers: Tremco, USG.
2. Use compressible closed-cell foam backer rod, as required.
3. To seal gaps 3/8 inch in dimension, and larger, pack with glass/mineral fiber batt prior to installing sealant materials.
4. Fiberglass batt insulation, friction fit type without integral vapor barrier membrane, thickness as shown on the drawings. Batt width to match stud spacing for self- supporting friction fit. Cut to fit irregular spaces. Butt edges into firm contact with each other and adjoining surfaces. Cut to fit tightly around openings and penetrations and around and behind electrical boxes. Pack additional strips of insulation around door and window frames to fill all voids. Pack around pipes, ducts, conduits, electrical boxes and other penetrating items to fill all voids.

I. Control Joint Locations: Gypsum board surfaces shall be isolated with control joints where:
1. Ceiling abuts a structural element, dissimilar wall or other vertical penetration.
2. Construction changes within the plane of the partition or ceiling.
3. Shown on approved shop drawings.
4. Ceiling dimensions exceed thirty (30) feet in either direction.
5. Wings of "L," "U," and "T" shaped ceiling areas are joined.
6. Expansion or control joints occur in the structural elements of the building.
7. Shaftwall runs exceed 30' without interruption.
8. Partition or furring abuts a structural element or dissimilar wall or ceiling.
9. Partition or furring runs exceed 30' without interruption.
10. Where control joints are required, ceiling height door frames may be used as control joints. Less than ceiling height frames shall have control joints extending to the ceiling from both corners.

J. Joint Treatment and Spackling
1. Joints between face wallboards in the same plane, joints at internal corners of intersecting partitions and joints at internal corners of intersections between ceilings and walls or partitions shall be filled with joint compound.
2. Screw heads and other depressions shall be filled with joint compound. Joint compound shall be applied in three (3) coats, feathered and finish surface sanded smooth with adjacent wallboard surface, in accordance with manufacturer's instructions. Treatment of joints and screw heads with joint compound is also required where wallboard will be covered by finish materials which require a smooth surface, such as vinyl wall coverings.

3.5 FURRED WALLS AND PARTITIONS

A. Steel Framing Installation Standard: Comply with ASTM C 754 and with ASTM C 844 requirements that apply to framing installation.

B. Install supplementary framing at terminations in the veneer plaster construction and for support of fixtures, accessories, and similar construction to comply with recommendations of veneer plaster manufacturer, or with “Gypsum Construction Handbook” published by United States Gypsum Co.

C. Accurately lay out partition and wall lines from the dimensions given on the drawings supplied during construction.

D. External angles of all partitions shall be reinforced as needed to brace wall and prevent vibration of door slams from rattling the partitions. Reinforcement shall be floor to ceiling post or other braces as approved.

E. Use specified metal furring channels. Run metal furring channel framing members vertically, space sixteen (16) inches o.c. maximum. Fasten furring channels to concrete or masonry surfaces with power-driven fasteners or concrete stub nails spaced sixteen (16) inches o.c. maximum through alternate wing flanges (staggered) of furring channel. Furring channels shall be shimmed as necessary to provide a plumb and level backing for wallboard. At inside of exterior walls, an asphalt felt protection strip shall be installed between each furring channel and the wall. Furring channel and splices shall be provided by nesting channels at least eight (8) inches and securely anchoring to concrete or masonry with two (2) fasteners in each wing.

F. Wallboard Installation: Same as specified under Article 3.4- "Metal Stud Partitions."

3.6 INSTALLATION OF STEEL FRAMING FOR WALLS AND PARTITIONS

A. Install runners (tracks) at floors, ceilings and structural walls and columns where gypsum drywall stud system abuts other construction.
   1. Where studs are installed directly against exterior walls, install asphalt felt strips between studs and wall.
   2. Secure runners to existing concrete slab at 24” o.c..
   3. Runners (tracks) shall be securely anchored to the supporting structure.

B. Installation Tolerances: Install each steel framing and furring member so that fastening surface do not vary more than 1/8 inch from plane of faces of adjacent framing.

C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.

D. Terminate partition framing at suspended ceilings where indicated.

E. Install steel studs and furring in sizes and at spacings indicated but not less than that required by referenced steel framing installation standard.
   1. For single- and double-layer construction: 24” o.c., unless otherwise indicated.
   2. Provide double steel studs at door openings, jambs, headers, etc.
   3. Provide horizontal channel bracing at midpoints between studs.
   4. Where jambs of door occur, a thru post shall be extended an secured to the ceiling slab as approved.

F. Install steel studs so that flanges point in the same direction and gypsum boards can be installed in the direction opposite to that of the flange.

G. Frame door openings to comply with details indicated, with GA-219 and with applicable published recommendations of gypsum board manufacturer. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
   1. Extend vertical jamb studs through suspended ceilings and attach to underside of floor or roof structure above.
   2. Jack studs or cripples shall be installed above door heads and elsewhere to furnish support and shall be securely attached to the supporting members.

H. Frame openings other than door openings to comply with details indicated, or if none indicated, in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads.

3.7 METAL STUD PARTITIONS

A. Runner Installation: Use channel type. Align accurately at floor according to partition layout. Anchor runners securely sixteen (16) inches o.c. maximum with power-driven anchors to floor slab, with power-driven anchors to structural slab above. See "Stud Installation" below for runners over heads of metal door frames. Where required, carefully remove sprayed-on fireproofing to allow partition to be properly installed.

B. Stud Installation
   1. Install metal stud components in accordance with ASTM C754, unless otherwise shown or specified. Space metal studs maximum of 16 in. o.c., unless otherwise shown. Install steel studs so flanges point in the same direction and leading edge or end of each gypsum board panel can be attached to open (unsupported) edges of stud flanges first.
   2. Use channel type, positioned vertically in runners, spaced as noted on drawings, but not more than sixteen (16) inches o.c.
   3. Anchor studs to floor runners with screw fasteners. Provide snap-in or slotted hole slip joint bolt connections of studs to ceiling runners leaving space for movement. Anchor studs at partition intersections, partition corners and where partition abuts other construction to floor and ceiling runners with sheet metal screws through each stud flange and runner flange.
   4. Connection at ceiling runner for non-rated partitions shall be snap-in or slotted hole slip joint bolt connection that shall allow for movement. Seal studs abutting other construction with 1/8" thick neoprene gasket continuously between stud and abutting construction.
   5. Connections for fire rated partitions at ceiling runners shall conform to UL Design #2079.
   6. Install metal stud horizontal bracing wherever vertical studs are cut or wallboard is cut for passage of pipes, ducts or other penetrations, and anchor horizontal bracing to vertical studs with sheet metal screws.
   7. At jambs of door frames and borrowed light frames, install doubled-up studs (not back-to-back) from floor to underside of structural deck, and securely anchor studs to jamb anchors of frames and to runners with screws. Provide cross braces from hollow metal frames to underside of slab.
   8. Over heads of door frames, install cut-to-length section of runner with flanges slit and web bent to allow flanges to overlap adjacent vertical studs, and securely anchor runner to adjacent vertical studs with sheet metal screws. Install cut-to- length vertical studs from runner (over heads of door frame) to ceiling runner sixteen (16) inches maximum o.c. and at vertical joints of wallboard, and securely anchor studs to runners with sheet metal screws.
   9. At control joints, in field of partition, install double-up studs (back-to-back) from floor to ceiling runner, with 1/4" thick continuous compressible gasket between studs. When necessary, splice

studs with eight (8) inches minimum nested laps and attach flanges together with two (2) sheet metal screws in each flange. All screws shall be self-tapping sheet metal screws.

10. Isolate framing from building structure to prevent transfer of loading imposed by structural movement both horizontally and vertically, at the following locations:
    a. Where edges of suspended ceilings abut building structure horizontally at ceiling perimeters or penetration of structural elements.
    b. Where partition and wall framing abuts overhead structure. Provide slip or cushioned type joints to attain lateral support and avoid axial loading.
11. Do not bridge building expansion and control joints with steel framing or furring members; independently frame both sides of joints with framing or furring members.

C. Runners and Studs at Chase Wall: As specified above for "Runners" and "Studs" and as specified herein. Chase walls shall have either a single or double row of floor and ceiling runners with metal studs sixteen (16) inches o.c. maximum and positioned vertically in the runners so that the studs are opposite each other in pairs with the flanges pointing in the same direction. Anchor all studs to runner flanges with sheet metal screws through each stud flange and runner flange following requirements of paragraph 3.4, B. Provide cross bracing between the rows of studs by attaching runner channels or studs set full width of chase attached to vertical studs with one self-tapping screw at each end. Space cross bracing not over thirty-six (36) inches o.c. vertically.

D. Wallboard Installation- Single Layer Application (Screw Attached)
1. Gypsum Board Application and Finishing Standard: Install and finish gypsum board to comply with ASTM C 84.
2. Install wall/partition boards in manner which minimizes the number of end- butt joints or avoids them entirely where possible. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs.
3. Install exposed gypsum board with face side out. Do not install imperfect, damaged, or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16-inch open space between boards. Do not force into place. All burred edges shall be smooth before application. Damaged edges shall be cut back neatly to sound board.
4. Locate either edge or end joints over supports, except in horizontal applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions. Boards shall be staggered so that the corners of any four (4) boards will not meet at the same point.
5. Attach gypsum board to steel studs so that leading edge or end of each board is attached to open (unsupported) edge of stud flange first.
6. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.
7. Spot grout hollow metal door frames for solid core wood doors, hollow metal doors and doors over 32 inches wide. Apply spot grout at each jamb anchor clip just before inserting board into frame.
8. Cover both faces of steel stud partition framing with gypsum board in concealed spaces (above ceilings, etc.), except in chase walls which are braced internally.
    a. Except where concealed application is indicated or required for sound, fire, air or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. area and may be limited to not less than 75 percent of full coverage.
    b. Fit gypsum board around ducts, pipes, and conduits.
    c. Where partitions intersect open concrete coffers, cut gypsum board to fit profile of

coffers and allow 1/4 to 1/2 inch wide joint for sealant.

9. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4 inch to 1/2-inch space and trim edge with “U” bead edge trim. Seal joints with acoustical sealant.
10. Where sound-rated drywall construction is indicated, seal construction at perimeters, control and expansion joints, openings, and penetrations with a continuous bead of acoustical sealant including a bead at both faces of partitions. Comply with ASTM C 919 and manufacturer’s recommendations for location of edge trim, and close off sound-flanking paths around or through construction, including sealing of partitions above acoustical ceilings.
11. Space fasteners in gypsum boards in accordance with referenced gypsum board application and finishing standard and manufacturer’s recommendations.
12. All wall board to extend above the ceilings a minimum of six (6) inches.
13. Joints on opposite sides of partitions shall be arranged as to occur on different studs. All joints shall be neatly fitted and staggered.
14. Install wallboard with long dimension parallel to framing member and with abutting edge joints over web of framing member. Install wallboard with long dimension perpendicular to framing members above and below openings in drywall extending to second stud at each side of opening. Joints on opposite sides of wall shall be arranged to occur on different studs.
15. Boards shall be fastened securely to metal studs with screws as specified. Where a free end occurs between studs, back blocking shall be required. Center abutting ends over studs. Correct work as necessary so that faces of boards are flush, smooth, true.
16. Wallboard screws shall be applied with an electric screw gun. Screws shall be driven not less than 3/8" from ends or edges of board to provide uniform dimple not over 1/32" deep. Screws shall be spaced twelve (12) inches o.c. in the field of the board and 8" o.c. staggered along the abutting edges.
17. All ends and edges of wallboard shall occur over screwing members (studs or furring channels). Boards shall be brought into contact but shall not be forced into place. Where ends or edges abut, they shall be staggered. Joints on opposite sides of a partition shall be so arranged as to occur on different studs.
18. At locations where piping receptacles, conduit, switches, etc., penetrate drywall partitions, provide non-drying sealant and an approved sealant stop at cut board locations inside partition.

E. Wallboard Installation- Double-Layer Application
   1. General: See drawings for wallboard partition types required.
   2. First Layer (Screw Attached): Install as described above for single layer application.
   3. Second Layer (Screw Attached): Screw attach second layer, unless laminating method of attachment indicated on drawings or necessary to obtain required sound rating or fire rating. Install wallboard vertically with vertical joints offset thirty- four (34) inches from first layer joints and staggered on opposite sides of wall. Attach wallboard with 1-5/8" screws sixteen (16) inches o.c. along vertical joints and sixteen (16) inches o.c. in the field of the wallboard. Screw through first layer into metal framing members.
      a. Second Layer (Laminated): Install wallboard vertically. Stagger joints of second layer from first layer joints. Laminate second layer with specified laminating adhesive in beads or strips running continuously from floor to ceiling in accordance with manufacturer's instructions. After laminating, screw wallboard to framing members with 1-5/8" screws, spaced twelve (12) inches o.c. around perimeter of wallboard.

F. Wallboard Installation- Laminated Application: Where laminated wallboard is indicated, use specified laminating adhesive, install wallboard vertically and maintain tolerances as specified for screw attached wallboard.

G. Insulation Installation: Install where indicated on drawings. Place blanket tightly between studs.

H. Deflection of Structure Above: To allow for possible deflection of structure above partitions, provide top runners for non-rated partitions with 1-1/4" minimum flanges and do not screw studs or drywall to top runner. Where positive anchorage of studs to top runner is required, anchorage device shall be by means of slotted hole (in clip connection with screw attachment to web of steel through bushings located in slots of clips), or other anchorage device approved by Architect.

I. Control Joints
1. Leave a 1/2" continuous opening between gypsum boards for insertion of surface mounted joint.
2. Back by double framing members.
3. Attach control joint to face layer with 9/16" galvanized staples six (6) inches o.c. at both flanges along entire length of joint.
4. Provide two (2) inch wide gypsum panel strip or other adequate seal behind control joint in fire rated partitions and partitions with safing insulation.
5. Provide steel studs at door openings in accordance with the following schedule.

Door Width	Studs
Single doors to 2 ft.-8 in.	Two 25 gauge studs or one 20 gauge stud at each jamb and one additional stud no more than 6 in. from stud. At fire rated openings, use one 20 gauge stud only.
Single doors greater than 2 ft.- 8 in. to 4 ft.	One 20 gauge stud at each jamb and one additional stud no more than 6 in. from jamb studs
Single doors greater than 4 ft. and pairs of doors	Two 20 gauge studs at each jamb and one additional stud no more than 6 in. from jamb studs

a. Provide runner track and typical studs above door openings with studs spaced not more than 24 in. o.c
b. At welded frames with fixed anchor clips secure stud reinforcing to jamb anchor clips with not less than two self tapping screws per clip.
c. Provide additional framing, reinforcing and bracing at door head locations as required to provide a rigid installation. Bracing shall be attached to structural elements, beams, slabs, etc. Attachment to mechanical or electrical components will not be permitted.

3.8 GYPSUM WALL BOARD

A. Butt wallboard joints loosely together. Butt panels together for a light contact at edges and ends with not more than 1/16 in. of open space between panels. Do not place butt ends against recessed or tapered edges. Allow a maximum gap of 1/4 in. at end joints.

B. Install maximum practical lengths of gypsum board to span walls with minimum number of end butt joints. Where butt joints are necessary, stagger joints and locate as far as possible from center of walls.

C. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back blocking is provided behind end joints. Position adjoining panels so that tapered edges abut tapered edges, and field cut edges abut field cut edges and ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions. Avoid joints at corners of framed openings where possible. Attach gypsum panels to steel studs so that the leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

D. Install control joints in locations and as required. Obtain Consultant's approval for all locations. In fire rated partitions, install control joints so as not to compromise specified ratings. Note locations of control joints on shop drawings.

E. Install metal trim at exposed edges, frames, and other locations as shown. Fasten trim securely. Spot grout door frames at quarter points and jamb anchors. Use specified spot grout joint compound and apply before inserting face layer into frame.

F. Cut openings in gypsum board for electrical outlets, piping and other penetrations. Maintain close tolerances so that edges will be covered by plates and escutcheons. Cut both face and back paper. Do not install electrical outlets back-to-back on opposing sides of partitions.

G. Install fasteners not less than 3/8 in. from ends or edges of gypsum board sheets, spacing fasteners opposite each other on adjacent ends or edges. Begin fastening from center of gypsum board and proceed toward edges and corners. Apply pressure on surface of gypsum board adjacent to fasteners being driven to ensure that gypsum board will be secured tightly to supporting members. Drive fastener with shank perpendicular to face of board. Set heads of screws slightly below surface of paper without cutting paper. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard.

H. Install metal trim at exposed edges, frames, and other locations as shown. Fasten trim securely. Spot grout door frames at quarter points and jamb anchors. Use specified spot grout joint compound and apply before inserting face layer into frame.

I. At hollow metal door frames, cut gypsum boards to fit around hardware reinforcement or mortar boxes. Spot grout frames with a quick setting grout or compound at each jamb anchor clip just prior to inserting of boards into frame at doors. Insert boards into frame so that its edge is fully bedded against inside surface of the frame. Butter the edge of boards with joint compound if necessary to achieve full bedding.

J. Acoustic Sealing Requirements: Provide acoustical sealant at perimeter of gypsum board areas as follows unless otherwise shown or noted:
   1. At partition walls, provide continuous beads of acoustical sealant at juncture of both faces of runners or plates with floor and ceiling construction, and wherever gypsum board abuts dissimilar materials (i.e., doors and windows). Apply prior to installation of gypsum board.
   2. At ceilings, provide continuous beads of acoustical sealant wherever gypsum board abuts dissimilar materials.
   3. Provide continuous bead of acoustical sealant behind faces of control joints. Apply prior to installation of surface applied control joint accessories and locate at proper depth in joint to allow for insertion of expansion portion of control joint accessory.
   4. At openings and cutouts, fill open spaces between gypsum board and fixtures, cabinets, ducts and other flush or penetrating items, with continuous bead of acoustical sealant.
   5. Provide acoustical sealant at sides and backs of electrical boxes to completely seal openings and

joints.

6. Sound Flanking Paths: Where sound rated partition walls intersect non-rated gypsum board partition walls, extend sound rated construction to completely close sound flanking paths through non-rated construction. Provide acoustical sealant at joints between face layers at vertical interior angles of intersecting partitions.
7. Partition End Fillers: Install compressible filler continuously between window wall mullion and gypsum board partition end filler panels, maintaining a min. of 3/4 in. spacing to allow for curtain wall deflection. Utilize self-adhesive to position end fillers on curtain wall mullion. Adhesively apply compressible filler continuously from floor to ceiling including underside of soffit. Do not penetrate curtain wall mullion with any type of fastenings. Prior to installing partition studs or vertical support members, apply adhesive to side facing partition to allow for two-sided adhesion and a continuous seal.

3.9 SOUND CONTROLLED PARTITIONS

A. Provide the combination of gypsum boards and framing as shown. Apply acoustical sealant in beads under gypsum board each side of partitions at perimeters and at intersections. Size and place beads to ensure the STC rating of the wall system. Provide acoustical sealant beads in back of control joints, around outlet boxes, and at perimeter of cutouts to completely seal openings and joints.

B. Install acoustical insulation where shown. Form continuous layer for full height of partition and tightly abutting web of studs. Fit carefully behind electrical outlets and other penetrations. Attach to back face of gypsum board in accordance with manufacturer's instructions.

3.10 WATER RESISTANT GYPSUM BOARD INSTALLATION

A. Use as a substrate for ceramic tile and elsewhere as shown.

B. Pre-cut panels to required size and make necessary cut-outs. Treat cut or exposed panel edges before installation and maintain factory made paper edge at bottom of panels.

C. In areas to receive ceramic tile finish, treat all joints, penetrations and fastener heads with specified joint treatment.

3.11 GYPSUM BOARD CEILING AND INTERIOR SOFFIT INSTALLATION

A. Provide hangers and inserts necessary to support suspended ceilings and interior soffits below concrete slab before concrete is cast and in time to avoid delay in work. Give particular attention to the correct location and alignment of hangers and inserts. Frame openings with furring strips so that recessed items finish flush, unless shown.

B. Provide sufficient hangers for runner channels on each side of light fixtures, ceiling diffusers and grilles, access panels and other items penetrating the ceiling and/ or interior soffits.

C. Where ceilings and/ or interior soffits are suspended below ductwork, piping or other building elements which are not suitable for ceiling attachment due to strength limitations, or restrictions of local authorities having jurisdiction, provide additional supplemental framing, supports and related work as required to span beneath these elements from suitable support locations. Keep hangers and braces 2 in. clear of ducts, pipes and conduits.

D. Secure furring channels to primary carrying channels by clips or wire ties. Fasten gypsum board with screws to furring channels on 12 in. o.c.

3.12 CEMENTITIOUS BACKER BOARD INSTALLATION

A. Pre-cut board to required sizes, making necessary cut-outs. Fasten boards to studs with screws spaced not more than 8 in. center to center. Apply 2 in. wide fiberglass reinforcement tape over joints and corners; embed with mortar or adhesive used to set tile.

3.13 INSTALLATION OF CHASES

A. Align two parallel rows of floor and ceiling runners and secure as herein before specified for partitions. Position metal studs vertically in runners, 16 in. o.c. and secure to runners with screws. Brace studs with 2-1/2 in. metal studs installed horizontally at 48 in. o.c. Install gypsum board as specified for partitions.

3.14 PRESSURIZED VESTIBULES AND STAIRWAYS

A. General: Where scheduled as pressurized, construct wall and ceiling enclosure as specified for other fire rated construction to attain UL hourly rating shown.

B. Sealing: Seal perimeter joints between outlet boxes and other built-in items, and other penetrations through gypsum board. Use sealant as specified under Section 079200.

C. “Joint Sealants”, other acceptable materials, and methods as necessary to make installation airtight; no air leakage permitted.

3.15 DRYWALL FASCIAS AND CEILINGS

A. Furnish and install inserts, hanger clips and similar devices in coordination with other work.

B. Secure hangers to inserts and clips. Clamp or bolt hangers to main runners.

C. Space main runners 4'-0" o.c. and space hangers 4'-0" o.c. along runners, except as otherwise shown.

D. Level main runners to a tolerance of 1/4" in 12'-0", measured both lengthwise on each runner and transversely between parallel runners.

E. Metal Furring Channels: Space sixteen (16) inches o.c. maximum. Attach to 1-1/2" main runner channels with furring channel clips (on alternate sides of main runner channels). Furring channels shall not be let into or come in contact with abutting masonry walls. End splices shall be provided by nesting furring channels no less than eight (8) inches and securely wire tying. At any openings that interrupt the furring channels, install additional cross reinforcing to restore lateral stability.

F. Mechanical accessories, hangers, splices, runner channels and other members used in suspension system shall be of metal, zinc coated, or coated with rust inhibitive paint, of suitable design and of adequate strength to support units securely without sagging, and such as to bring unit faces to finished indicated lines and levels.
1. Provide special furring where ducts are over two (2) feet wide.

G. Apply board with its long dimension at right angles to channels. Locate board butt joints over center of furring channels. Attach board with one (1) inch self-drilling drywall screws twelve (12) inches o.c. in field of board; eight (8) inches o.c. at butt joints located not less than 3/8" from edges.

3.16 SHAFT WALLS

A. Provide consisting of metal runners, studs, gypsum board and fasteners. Provide fireproof assemblies for the hourly rating shown or required and complying with UL listing.

B. Do not bridge building expansion joints with shaft wall system, frame both sides of joints with furring and other support as indicated.

C. Install supplementary framing, blocking and bracing to support gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings and similar work which cannot be adequately supported directly by regular framing of gypsum board shaft wall system.

D. Support elevator hoist way door frames independently of shaft wall framing system or reinforce system in accordance with system manufacturer's instructions.

E. Runner Installation: Use "J" metal runners at floor and ceiling, with the short leg toward finish side of wall. Securely attach runners to structural supports with power- driven fasteners at both ends and twenty-four (24) inches o.c.

F. Shaft Wall Liner: Cut shaft wall liner panels one (1) inch less from floor to ceiling height and erect vertically between J-runners.

G. C-H Studs: Cut metal "C-H" studs 3/8" to not more than 1/2" less than floor to ceiling height and install between shaft wall liner panels so that panels are fitted snugly into the one (1) inch wide "H" portion of the stud. Space studs twenty-four (24) inches o.c., unless otherwise indicated on drawings. Install full-length steel E-Studs or runners vertically at T-intersections, corners, door jambs, and columns. Install full length E- Studs over shaft wall liner both sides of closure panels. Frame openings cut within a liner panel with J-Runner around perimeter. For openings, frame with vertical E-Stud or runner at edges, horizontal runner at head and sill, and reinforcing as shown on the drawings. Suitably frame all openings to maintain structural support for wall. Install floor-to-ceiling steel E-Studs each side of elevator door frames to act as strut-studs. Attach strut-stud to floor and ceiling runners with two (2) 3/8" Type S screws, space twelve (12) inches o.c. Over metal doors, install a cut to length section of runner and attach to strut-studs with clip angles and 3/8" Type S Screws space twelve (12) inches o.c.

H. Wallboard Installation- Double Layer Installation: Erect gypsum wallboard base layer horizontally one side of studs with end joints staggered. Fasten base layer panels to studs with one (1) inch Type S screws twenty-four (24) inches o.c. Caulk perimeter of base layer panels. Apply gypsum wallboard face layer

vertically over base layer with joints staggered and attached with 1-5/8" Type S screws staggered from those in base, spaced eight (8) inches o.c. and driven into studs.

I. Wallboard Installation (Where Both Sides of Shaft Wall are Finished): Apply gypsum wallboard face layers vertically both sides of studs. Stagger joints on opposite partition sides. Fasten panels with one (1) inch or two (2) inches Type S screws spaced eight (8) inches o.c. in field and along edges into studs.

J. Cants: Provide one (1) inch thick shaft wall liner, cut to suit condition, at beams and other projections wider than two (2) inches in elevator shafts. Cants shall slope seventy-five (75) degrees from the horizontal. Screw attached shaft wall liner to the vertical metal studs.

K. Where handrails are indicated for direct attachment to gypsum board shaft wall system, provide not less than a 18 gauge thick by 4 in. wide galvanized steel reinforcement strip, accurately positioned and secured behind not less than one gypsum board face layer of 5/8 in. thickness.

L. Coordinate gypsum board shaft wall construction with sprayed-on fireproofing of the structure, so that both remain complete and undamaged. Patch or replace sprayed-on fireproofing removed or damaged during the installation of the shaft wall system.
   1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 in. o.c.
   2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of gypsum board assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire- resistance rating indicated. Protect remaining fire-resistive materials from damage.

M. At penetrations in shaft wall, maintain fire resistance rating of entire shaft wall assembly by installing supplementary fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

N. Isolate shaft wall system from transfer of structural loading to system, both horizontally and vertically. Provide slip or cushioned type joints to attain lateral support and avoid axial loading. Comply with details shown and with manufacturer's instructions.

O. Seal gypsum board shaft walls at perimeter of each section which abuts other work and at joints and penetrations within each section. Install acoustical sealant to withstand dislocation by air pressure differential between shaft and external spaces; comply with ASTM C919.

P. In elevator shafts where gypsum board shaft wall system cannot be positioned within 2 in. of shaft face of structural beams, floor edges and similar projections into shaft, install 5/8 in. thick gypsum board cants covering tops of projections as follows:
   1. Slope cant panels not more than 15 deg. from vertical. Set base-edge of panels in gypsum board adhesive and secure top edges to shaft walls at 24 in. o.c. with screws fastened to shaft wall framing.
   2. Where cants exceed 2 in., support gypsum board with steel studs spaced 24 in. o.c.; extend studs from top of projection to shaft wall framing behind cant.

Q. Stair and elevator enclosures utilizing shaft wall assemblies shall be constructed with impact resistant construction board sheathed on the impact face of the stair or elevator enclosure wall assembly with the impact face considered as the exterior of the stair or elevator enclosure, on the occupied side of the building, and shall be comprised of two layers of construction boards. The impact resistant gypsum board used as the base layer panel shall meet or exceed impact ASTM C1629 Classification Level 2, and the face panel shall be a minimum 5/8" gypsum board.
   1. Studs shall be minimum 3-½ in. depth metal studs, at least 33 mils thick (20 gauge). Vertical studs shall be spaced at a maximum distance of 24 in., on center unless otherwise shown or specified.
   2. Runners shall be securely attached at the floor and ceiling to structural element members in such a manner that provides lateral resistance in excess of the equivalent energy of Soft Body Impact Classification Level 2 of ASTM C1629. The installation of top and bottom runner tracks shall be subject to controlled inspection.

R. Integrate stair hanger rods with gypsum board shaft wall system where indicated (and where possible); by locating rod in cavity of system as required to enclose rods.

3.17 ERECTION AT COLUMN ENCLOSURES

A. Metal furring supports shall be provided under work of this Section, and shall be cut to lengths as necessary for tight fit such that spacing is not more than sixteen (16) inches o.c.

B. Board shall be fastened securely to supports with screws as specified. Place boards in position with minimum number of joints. Where free ends occur between supports, back-blocking or furring shall be required. Center abutting ends over supports. Correct work as necessary so that faces of boards are flush, smooth, and true. Provide clips or cross furring for attachment as required.

C. All layers shall be screw attached to furring.

D. When column finish called for on drawings to be in the same plane as drywall finish layer, maintain even, level plane.

3.18 FINISHING

A. Taping: A thin, uniform layer of taping compound shall be applied to all joints and angles to be reinforced. Reinforcing tape shall be applied immediately, centered over the joint, seated into the compound. A skim coat shall follow immediately but shall not function as a fill or second coat. Tape shall be properly folded and embedded in all angles to provide a true angle.

B. Filling: After taping compound has hardened, topping compound shall be applied, filling the board taper flush with the surface. The fill coat shall cover the tape and feather out slightly beyond the tape. On joints with no taper, the fill coat shall cover the tape and feather out at least four (4) inches on either side of the tape. No fill coat is necessary on interior angles.

C. After topping compound is set, a finishing coat of topping compound shall be spread evenly over and extending slightly beyond the fill coat on all joints and feathered to a smooth, uniform finish. Over tapered edges, the finished joint shall not protrude beyond the plane of the surface. All taped angles shall receive a finish coat to cover the tape and taping compound and provide a true angle. Where

necessary, sanding shall be done between coats and following the final application of compound to provide a smooth surface, ready for painting.

D. Fastener Depressions: Taping compound shall be applied to all fastener depressions followed, when hardened by at least two (2) coats of topping compound, leaving all depressions level with the plane of the surface.

E. Finishing Beads and Trim: Taping compound shall be applied to all bead and trim and shall be feathered out from the ground to the plane of the surface. When hardened, this shall be followed by two (2) coats of topping compound each extending slightly beyond the previous coat. The finish coat shall be feathered from the ground to the plane of the surface and sanded as necessary to provide a flat, smooth surface ready for decoration.

F. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.
1. Level 1 for ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
2. Level 2 where panels form substrates for tile and where indicated.
3. Level 5 for exposed gypsum board surfaces.

G. Use the following joint compound combination as applicable to the finish levels specified.
1. Embedding and First Coat: Ready-mixed, drying-type, all-purpose or taping compound. Fill (Second) Coat: Ready-mixed, drying-type, all-purpose or topping compound. Finish (Third) Coat: Ready-mixed, drying-type, all-purpose or topping compound.

H. Where Level 2 gypsum board finish is indicated, embed tape in joint compound and apply first coat of joint compound.

I. Where Level 1 gypsum board finish is indicated, embed tape in joint compound.

J. Finish water-resistant gypsum backing board forming base for ceramic tile to comply with ASTM C 840 and gypsum board manufacturer’s directions for treatment of joints behind tile.

K. Finish glass-mat, water-resistant gypsum backing board to comply with gypsum board manufacturer’s directions.

L. Finish cementitious backer units to comply with unit manufacturer’s directions.

M. Where Level 5 gypsum board finish is indicated, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories; and apply a thin, uniform skim coat of joint compound over entire surface. For skim coat, use joint compound specified for third coat, or a product specially formulated for this purpose and acceptable to gypsum board manufacturer. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects, tool marks, and ridges and ready for decoration.

N. Level 5 Finish for Areas Exposed to View: In all areas exposed to view, finish gypsum board in accordance with ASTM C840, Level 5, unless otherwise shown or specified. Level 5 consists of embedding the tape in joint compound at joints and angles and applying (2) two separate additional coats of joint compound over joints, angles, fastener heads, and flanges of trim accessories. Apply a

thin skim coat of joint compound or material manufactured especially for this purpose to the entire surface. Panel surfaces and joint compound must be smooth and free of tool marks and ridges and applying a skim coat of joint compound over entire surface. Surfaces must be smooth and free of tool marks and ridges.

O. Level 4 Finish for Non-Public Spaces: In mechanical equipment rooms, elevator machine rooms, electrical closets, utility rooms and other similar type rooms not exposed to view, finish gypsum board in accordance with ASTM C840, Level 4, unless otherwise shown or specified. Level 4 consists of embedding the tape in joint compound at joints and angles and applying (2) two separate additional coats of joint compound over joints, angles, fastener heads, and flanges of trim accessories. Panel surfaces and joint compound must be smooth and free of tool marks and ridges.

P. Level 2 Finish for Gypsum Board Utilized as Substrate for Ceramic Tile or Other Tile Like Finishes: In areas scheduled for installation of ceramic tile or other tile like finishes, finish gypsum board in accordance with ASTM C840, Level 2, unless otherwise shown or specified. Level 2 consists of embedding the tape in joint compound at joints and angles and applying (1) one separate coat of joint compound over joints, angles, fastener heads, and flanges of trim accessories. Panel surfaces and joint compound must be smooth and free of tool marks and ridges.

Q. Acoustical Sealant: Fill openings around cutouts, penetrations and other openings with acoustical sealant.

R. Reinforcement: Reinforce joints at tapered edges and interior corners with joint reinforcing tape set in joint compound in accordance ASTM C840, levels of finish as specified.

S. Installation of Metal Trim: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board.

T. Drywall construction with defects of such character which will mar appearance of finished work, or which is otherwise defective, will be rejected and shall be removed and replaced at no expense to the Owner.

3.19 FIELD QUALITY CONTROL

A. Subcontractor’s Quality Control Responsibilities: Subcontractor is solely responsible for quality control of the Work.

B. Tolerances
1. Light gauge framing within 1/8 in. in 10 ft. (non-cumulative) for plumbness and level, +/- 1/8 in. for fastening surfaces of adjacent framing members and for deviation from specified spacing.
2. Finish board surfaces within 1/4 in. in 10 ft. (non-cumulative) for plumb, level, warp and bow.
3. Finish board surfaces within+/- 1/4 in. from plan location.
4. Finish board surfaces within 1/16 in. between planes of board faces.

3.20 CLEANING AND ADJUSTMENT

A. At the completion of installation of the work, all rubbish shall be removed from the building leaving floors broom clean. Excess material, scaffolding, tools and other equipment shall be removed from the building.

B. Work shall be left in clean condition ready for painting or wall covering. All work shall be as approved by Architect.

C. Cutting and Repairing: Include all cutting, fitting and repairing of the work included herein in connection with all mechanical trades and all other trades which come in conjunction with any part of the work, and leave all work complete and perfect after all trades have completed their work.

3.21 PROTECTION OF WORK

A. Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures gypsum drywall construction being without damage or deterioration at time of Substantial Completion

B. Installer shall advise Contractor of required procedures for protecting drywall work from damage and deterioration during remainder of construction period.

3.22 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

B. All gypsum boards shall be 5/8" thick, equivalent to "Fire Code C" by United States Gypsum Co., unless otherwise indicated by the Architect or directed by DCAS, or furnish an approved equal.

C. All steel studs shall be 22 gage (20 gage, for partitions over 10') and spaced at 24 inches on center, unless otherwise indicated by the Architect or directed by DCAS.

D. All gypsum board partitions shall include acoustical insulation and sealant (ASTM E 136- 65), fireproofing, taping and joint compounding for a complete wall assembly installation and made ready for application of finish, and all shall be deemed included in the Unit Price.

E. Where indicated, provide materials and construction identical to those of assemblies with fire resistance ratings at no additional cost to the City.

F. All gypsum board partitions and assemblies shall include fiberglass batt insulation deemed included in the Unit Price. The characteristics of R-value, facing, lining, spacing, etc. shall be determined by the Architect and deemed included in the Unit Price at no additional cost to the City.

END OF SECTION 092900

SECTION 093000
TILING

PART 1 – GENERAL

1.1 SUMMARY

A. Work Included: Provide tile in accordance with the Contract Documents. The Work of this Section shall include the furnishing and installation of tiles required as indicated on the plans/drawings and required by the job conditions. Work includes, but not limited to floors, bases, walls and all materials necessary for a complete and proper installation. The Work of this Section shall include but not be limited to the following:
   1. Unglazed ceramic mosaic tile.
   2. Glazed ceramic mosaic tile.
   3. Unglazed quarry tile.
   4. Glazed wall tile.
   5. Stone thresholds.
   6. Large Format Tiles
   7. Bevel existing stone threshold for ADA compliance.
   8. Thin porcelain tiles setting mortars and adhesives.

B. Related Sections: The following sections contain requirements that relate to this Section:
   1. Division 2 Section “Demolition and removal of selected portions of buildings and site elements.” for removal of existing tile.
   2. Division 3 Section “Cast-In-Place Concrete” for monolithic slab finishes specified for tile substrates.
   3. Division 7 Section “Joint Sealants” for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
   4. Division 9 Section “Gypsum Plastering” for Portland cement scratch coat over metal lath on wall surfaces.
   5. Division 9 Section “Gypsum Board Assemblies” for cementitious backer units installed as part of gypsum wallboard systems.

1.2 REFERENCES

A. General: Comply with the applicable provisions and recommendations of references, except as modified by governing codes and by the Contract Documents. Where a recommendation or suggestion occurs in the references, such recommendation or suggestion shall be considered mandatory. In the event of conflict between references, this specification or within themselves, the more stringent standard or requirement shall govern.
   1. Tile Council of America: TCA "Handbook for Ceramic Tile Installation". American National Standards Institute
      a. ANSI A137.1 "Standard Specifications for Ceramic Tile.”
      b. ANSI A108/A118/A136 "Standard Specifications for the Installation of Ceramic Tile."
   2. International Organization for Standardization (ISO):

1.3 SYSTEM DESCRIPTION

A. Performance Criteria
   1. Slip Resistance (COF) Values: Tile indicated to be used on floor surfaces, as manufactured, shall bear a coefficient of friction of not less than 0.6 for horizontal surfaces and stair treads and 0.8 for ramps or inclined surfaces when tested in accordance with ASTM C1028 under both wet and dry conditions.

1.4 SUBMITTALS

A. Product data for each type of product specified.

B. Shop drawings indicating tile patterns and locations and widths of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for initial selection purposes in form of manufacturer’s color charts consisting of actual tiles or sections of tile showing full range of colors, textures, and patterns available for each type and composition of tile indicated. Include samples of grout and accessories involving color selection.

D. Samples for verification purposes of each item listed below, prepared on samples of size and construction indicated, products involve color and texture variations, in sets showing full range of variations expected.
   1. Each type and composition of tile and for each color and texture required, at least 12 inches square, mounted on plywood or hardboard backing and grouted.
   2. Full-size units of each type of trim and accessory for each color required.
   3. Stone thresholds in 6-inch lengths.

E. Material test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of tile and tile setting and grouting products with requirements indicated.

F. The Architect reserves the right to select tiles as approved equals. Color and pattern will be selected by the Architect.

G. Master Grade Certificates: Prior to opening ceramic tile containers, submit to the Architect a Master Grade Certificate, signed by an officer of the firm manufacturing the ceramic tile used, and issued when the shipment is made, stating the grade, kind of tile, identification marks for tile containers, and the name and location of the project.

H. Mock-ups
   1. At an area on the site where approved by the Architect, provide a mock-up ceramic tile installation.
      a. Make the mock-up approximately 3’0” x 3’0” in dimension.
      b. Provide one mock-up for each type, class, and color of installation required under this Section.
      c. The mock-ups may be used as part of the Work, and may be included in the finished Work, when so approved by the Architect.
      d. Revise as necessary to secure the Architect's approval.
   2. The mock-ups, when approved by the Architect, will be used as datum for comparison with the remainder of the work of this Section for the purposes of acceptance or rejection.
   3. If the mock-up panels are not permitted to be part of the finished Work, completely demolish

and remove them from the job site upon completion and acceptance of the work of this Section.

I. Quality Control Submittals: Submit the following for Consultant's information.
   1. Certificates
      a. Document Review: Before commencing work, submit a written statement signed by the Contractor and the Applicator certifying that the Contract Documents, shop drawings and product data have been reviewed with material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.
      b. Certificate of Compliance to ANSI A137.1 prior to submission of samples for review.
      c. "Master Grade Certificate" in the form approved in ANSI 137.1 for each type of tile, signed by the manufacturer, certifying to the grade, type, and quantity of tile, together with satisfactory information for identification of the containers to which they apply. These certificates shall be supplied promptly after material has been shipped from the factory.
      d. Certification from the manufacturers of dry-set mortar and grouts that their products conform to the appropriate ANSI "Materials" specifications.

J. Closeout Submittals: Submit, the following for Owner's documentation.
   1. Warranties: Special warranties as specified.
   2. Maintenance Manuals: Two (2) complete maintenance manuals describing the materials and procedures to be followed in cleaning and maintaining the tiling Work. Include manufacturers' brochures and instruction sheets describing the actual products used in the Work, including tile, adhesive, mortar, grout, sealer, and related components.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

B. Single-Source Responsibility for Setting and Grouting Materials: Obtain ingredients of a uniform quality from one manufacturer for each cementitious and admixture component and from one source or producer for each aggregate.

C. Single Source Responsibility for Waterproofing/Crack Suppression Materials: Obtain waterproofing/ crack suppression materials and associated accessories from one manufacturer for each type waterproofing/crack suppression system.

D. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from such authorities.

E. Pre-Installation Meeting: Prior to the installation of tile, meet at the project site to review the material selections, substrate preparations, installation procedures, coordination with other trades, special details and conditions, standard of workmanship, and other pertinent topics related to the Work.

F. Codes and Standards: Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from such authorities in addition to complying with all pertinent codes

and regulations, comply with the following:

1. Manufacture all ceramic tile in accordance with Standard Grade Requirements of ANSI A-137.1.
2. Install all ceramic tile in accordance with the recommendations contained in Handbook for Ceramic Tile Installation of the Tile Council of America, Inc., latest edition.

G. Installer Qualifications: Engage an experienced Installer who has successfully completed tile installations similar in scope, material, and design to that indicated for Project. Use only thoroughly trained and experienced journeyman tile setters who are completely familiar with the requirements of this work, and the recommendations contained in the referenced standards.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping Handling and Unloading: Deliver materials, other than bulk materials, in manufacturer's unopened containers fully identified with grade labels as specified in ANSI 137.1, and with name, brand, type, class, size, color and pattern. Store materials above grade and protect from weather and damage from any source. Store in accordance with manufacturer's instructions. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

B. Store all materials under cover in a manner to prevent damage and contamination, store only the specified materials at the job site.

C. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

D. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

E. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer’s written instructions.

B. Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.

C. Maintain temperatures at not less than 50 deg. F. in tiled areas during installation and for 7 days after completion.

1.7 WARRANTY

A. Warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

1. Special Warranty: Provide a written warranty, directly to the Owner, for a three (3) year period, agreeing to repair or replace Work which has failed because of defects in materials or workmanship. Upon notification of such defects, within the warranty period, make the necessary repairs and replacements, at the convenience of the Owner. Warranty shall be signed by the

Contractor, the manufacturer, and the applicator.

1.8 EXTRA MATERIALS

A. Deliver extra materials to the CITY. Furnish extra materials that match products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.
   1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
   1. Unglazed and/ or Glazed Ceramic Mosaic Tile:
      a. American Olean Tile Co., Inc.
      b. Dal-Tile Corp. – (Ceramic Tile)
      c. United States Ceramic Tile Co.
      d. Or an Approved Equal.
   2. Unglazed Quarry Tile:
      a. American Olean Tile Co., Inc.
      b. Dal-Tile Corp.
      c. Summitville Tiles, Inc.
      d. Or an Approved Equal.
   3. Unglazed and/ or Glazed Wall Tile:
      a. American Olean Tile Co., Inc.
      b. Dal-Tile Corp.
      c. United States Ceramic Tile Co.
      d. Or an Approved Equal.
   4. Dry-Set Mortars and Grouts:
      a. American Olean Tile Co., Inc.
      b. Laticrete International Inc.
      c. Summitville Tiles, Inc.
      d. Or an Approved Equal.
   5. Latex-Emulsion-Based Latex-Portland Cement Mortars:
      a. American Olean Tile Co., Inc.
      b. DAP Inc. Div.; USG Corp. (caulks, sealants and adhesives)
      c. Laticrete International Inc.
      d. Summitville Tiles, Inc.
      e. Or an Approved Equal.
   6. Water-Cleanable Tile Setting Epoxy Adhesives:
      a. American Olean Tile Co., Inc.
      b. Atlas Minerals & Chemicals, Inc.
      c. Summitville Tiles, Inc.
      d. Or an Approved Equal.
   7. Organic Adhesives, Type I:
      a. American Olean Tile Co., Inc.

b. DAP Inc. Div.; USG Corp.
c. Laticrete International Inc.
d. Or an Approved Equal.

8. Commercial Portland Cement Grouts:
   a. American Olean Tile Co., Inc.
   b. Bostik Construction Products Div.
   c. Custom Building Products.
   d. Or an Approved Equal.
9. Acrylic Emulsions for Latex-Portland Cement Grouts:
   a. American Olean Tile Co., Inc.
   b. Bostik Construction Products Div.
   c. Custom Building Products.
   d. DAP Inc. Div.; USG Corp.
   e. Laticrete International Inc.
   f. Or an Approved Equal.
10. Porcelain Tile Panels:
    a. Laminam by Crossville, Inc.
    b. Or an Approved Equal.

2.2 PRODUCTS, GENERAL

A. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 “American National Standard Specifications for Ceramic Tile” for types, compositions, and grades of tile indicated.
   1. Furnish tile complying with “Standard Grade” requirements unless otherwise indicated.

B. ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with products and materials indicated for setting and grouting.

C. Colors, Textures, and Patterns: Where manufacturer’s standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
   1. Provide selections made by Architect from manufacturer’s full range of standard colors, textures, and patterns for products of type indicated.
   2. Provide tile trim and accessories that match color and finish of adjoining flat tile. Provide ceramic trimmers, bullnose, and shapes to match wall and/ or floor as required for complete installation.

D. Factory Blending: For tile exhibiting color variations within the ranges selected during sample submittals, blend tile in factory and package accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples.

E. Mounting: Where factory-mounted tile is required, provide back- or edge-mounted tile assemblies as standard with manufacturer unless another mounting method is indicated.

2.3 TILE PRODUCTS

A. Unglazed Ceramic Mosaic Tile: Provide factory-mounted flat tile complying with the following requirements:
   1. Composition: Porcelain.

2. Composition: Porcelain with abrasive admixture.
3. Nominal Facial Dimensions: 1-inch x 1-inch +/- 1/4-inch
4. Actual size: 2-inch x 2-inch +/- 1/4 inch
5. Varies: 4-inch x 4-inch +/- 1/4 inch 6-inch x 6-inch +/- 1/4 inch.
6. Nominal Thickness: 1/4 inch.
7. Face: Plain with cushion edges.

B. Glazed Ceramic Mosaic Tile: Provide factory-mounted flat tile complying with the following requirements:
1. Composition: Porcelain.
2. Nominal Facial Dimensions: 1 inch x 1 inch +/- 1/4 inch.
3. Actual Size: 2-inch x 2 inch +/- 1/4 inch.
4. Varies: 4-inch x 4 inch +/- ¼ inch 6-inch x 6 inch +/- 1/4 inch.
5. Nominal Thickness: 1/4 inch.
6. Face: Plain with cushion edges.

C. Unglazed Quarry Tile: Provide square-edged flat tile complying with the following requirements:
1. Wearing Surface: Abrasive aggregate embedded in surface where indicated; nonabrasive elsewhere.
2. Nominal Facial Dimensions: 6 inches by 6 inches, 12 inches by 24 inches, 24 inches by 24 inches or 36 inches by 36 inches.
3. Nominal Thickness: 3/8 inch.
4. Face: Plain.

D. Glazed Wall Tile: Provide flat tile complying with the following requirements:
1. Nominal Facial Dimensions: 4-1/4 inches by 4-1/4 inches (or 2 inches x 2 inches) 12 inches x 24 inches, 24 inches x 24 inches or 36 inches x 36 inches.
2. Nominal Thickness: 5/16 inch.
3. Face: Plain with modified square edge or cushion edge.
4. Mounting: Factory back mounted.

E. Unglazed Wall Tile: Provide flat tile complying with the following requirements:
1. Nominal Facial Dimensions: 4-1/4 inches x 4-1/4 inches (or 2 inches x inches) 12 inches x 24 inches, 24 inches x 24 inches or 36 inches x 36 inches.
2. Nominal Thickness: 5/16 inch.
3. Face: Plain with modified square edge or cushion edge.
4. Mounting: Factory back mounted.

F. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with following requirements:
1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile where applicable.
2. Shapes: As follows, selected from manufacturer's standard shapes:
   a. Base for Portland Cement Mortar Installations: Coved.
   b. Base for Thinset Mortar Installations: Straight.
   c. Wainscot Cap for Portland Cement Mortar Installations: Bullnose cap.
   d. Wainscot Cap for Thinset Mortar Installations: Surface bullnose.
   e. Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot is shown flush with wall surface above.
   f. External Corners for Portland Cement Mortar Installations: Bullnose shape with a radius of

at least 3/4 inch unless otherwise indicated.

g. External Corners for Thinset Installations: Surface bullnose.

h. Internal Corners: Field-butted square corners, except use coved base and cap angle pieces designed to member with stretcher shapes.

G. Water Absorption: Tile installed on floors shall be slip resistant and have water absorption not to exceed 0.5%.

H. Porcelain Tile Panels: Provide flat tile complying with the following requirements:

1. Nominal Facial Dimensions: 12 inches x 24 inches, 24 inches x 24 inches, and 36 inches x 36 inches.
2. Nominal Thickness: 5/16 inch.
3. Face: Plain with modified square edge or cushion edge.
4. Mounting: Factory back mounted.

2.4 STONE THRESHOLDS

A. General: Provide stone that is uniform in color and finish, fabricated to sizes and profiles indicated or required to provide transition between tile surfaces and adjoining finished floor surfaces.

B. Marble Thresholds: Provide marble thresholds complying with ASTM C 503 requirements for exterior use and for abrasion resistance where exposed to foot traffic, a minimum hardness of 10 per ASTM C 241.

1. Provide White, Pink Tennessee, or any other color and shade to match existing (or replace in kind), honed marble complying with MIA Group “A” requirements for soundness.

C. Stone Thresholds: Provide stone threshold as specified by the Architect or as directed by DCAS.

2.5 WATERPROOFING FOR THINSET TILE INSTALLATIONS

A. Latex Rubber Waterproofing: Manufacturer’s standard factory-prepackaged, job-mixed, proprietary two-part formulation consisting of liquid latex rubber and powder for trowel application and glass fiber fabric reinforcing.

B. Available Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:

1. Latex Rubber Waterproofing:
   a. “Laticrete 301/335 Waterproof Membrane”; Laticrete International Inc.
   b. Or an Approved Equal.

2.6 SETTING MATERIALS

A. Portland Cement Mortar Installation Materials: Provide materials complying with ANSI A108.02 and as specified below.

1. Reinforcing Wire Fabric: Galvanized welded wire fabric, 2 inches by 2 inches - WO.3 by WO.3 (16 ASW gage or 0.0625-inch diameter); comply with ASTM A 185 and ASTM A 82 except for minimum wire size.
2. Expanded Metal Lath: Provide diamond mesh lath complying with ASTM C 847 for requirements indicated below:
   a. Base Metal and Finish for Interior Applications: Fabricate lath from uncoated or zinc-coated

(galvanized) steel sheet, with uncoated steel sheet painted after fabrication into lath.
b. Configuration Over Studs and Furring: Flat.
c. Configuration Over Solid Surfaces: Self-furring.
d. Weight: 3.4 psf.

3. Latex additive (water emulsion) described below, serving as replacement for part or all gauging water, of type specifically recommended by latex additive manufacturer for use with job-mixed Portland cement and aggregate mortar bed.
   a. Latex Additive: Acrylic resin.

B. Dry-Set Portland Cement Mortar: ANSI A118.1.

C. Latex-Portland Cement Mortar: ANSI A118.4, composition as follows:
1. Prepackaged dry mortar mix composed of portland cement, graded aggregate, and the following dry polymer additive in the form of a re-emulsifiable powder to which only water is added at job site.
   a. Dry Polymer Additive: Polyvinyl acetate or ethylene vinyl acetate.
2. Latex additive (water emulsion) of type described below, serving as replacement for part or all gauging water, combined at job site with prepackaged dry mortar mix supplied or specified by latex additive manufacturer.
   a. Latex Type: Acrylic resin.

D. Organic Adhesive: ANSI A136.1, Type I for installation of ceramic tile on drywall. Shear strength shall be 50 psi minimum. Adhesive primer as recommended by adhesive manufacturer. Manufacturer shall certify, in writing, that adhesive and primer used are proper types for the intended tile types and application.

E. Water: Clean, fresh and suitable for drinking.

2.7 GROUT MATERIALS

A. Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate as required to produce colors selected by DCAS.

B. Standard Cement Grout: ANSI A118.6, color as selected by DCAS.

C. Dry-Set Grout: ANSI A118.6, color as indicated.

D. Latex-Portland Cement Grout: ANSI A118.6, color as indicated, composition as follows:
1. Latex additive (water emulsion) serving as replacement for part or all gauging water, added at job site with dry grout mixture, with type of latex and dry grout mix as follows:
   a. Latex Type: Acrylic resin.
   b. Dry Grout Mixture: Dry-set grout specified or supplied by latex additive manufacturer. Use latex additive without retarder with dry-set grout.
      1. Application: Use dry-set grout combined with latex additive for grouting joints in glazed wall tile.
   c. Dry Grout Mixture: Commercial portland cement specified or supplied by latex additive manufacturer.
      1. Application: Use commercial portland cement grout combined with latex additive for grouting joints in floor tile unless otherwise indicated.

E. Water: Clean, fresh, and suitable for drinking.

2.8 ELASTOMERIC SEALANTS

A. General: Provide sealants as specified herein and that comply with requirements of Division 7 Section "Joint Sealers," including ASTM C 920 as referenced by Type, Grade, Class, and Uses.

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

C. One-Part Mildew-Resistant Silicone Sealant: ASTM C920, Type S; Grade NS; Class 25; Uses NT, G, A, and as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes.

D. Available Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:
   1. One-Part Mildew-Resistant Silicone Sealant:
      a. "Dow Corning 786"; Dow Corning Corp.
      b. "SCS 1702"; General Electric Co.
      c. "863 #345 White"; Pecora Corp.
      d. "Rhodorsil 6B White"; Rhone-Poulenc Inc.
      e. "Proglaze White"; Tremco Corp.
      f. Or an Approved Equal.

2.9 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with requirements of referenced standards and manufacturers including those for accurate proportioning of materials, water, or additive content; type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortars and grouts of uniform quality with optimum performance characteristics for application indicated.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates and areas where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
   1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
   2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
   3. Verify that concrete substrates for tile floors installed with adhesives bonded mortar bed or thin set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
      a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
      b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Blending: For tile exhibiting color variations within the ranges selected during sample submittals, verify that tile has been blended in factory and packaged accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

B. Condition of Surfaces: Allowable variations in substrate levels Flooded: +/- 1/8” in 10’ - 0” distance and 1/4” total maximum variation from levels shown. Grind or fill concrete and masonry substrates as required to comply with allowable variations.

C. Preparation: Etch concrete substrate with 10% solution of muriatic acid as may be required to remove substance that would interfere with proper bond of setting bed. Rinse with water to remove all traces of acid. Surface must meet finish requirements as noted in ANSI 108.01.

D. Coordinate the following with Section 033000.
1. Steel trowel and fine broom finish concrete slabs that are to receive ceramic tile. Cure concrete slabs that are to receive tile before tile application. Do not use liquid curing compounds or other coatings that may prevent bonding of tile setting materials to slabs. Slab shall be dry at time of tile installation.

E. Field Applied Temporary Protective Coating: Pre-coat tile with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

F. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thin set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

G. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.

3.3 INSPECTION

A. General: Examine the substrates, adjoining construction and the conditions under which the Work is to be installed. Do not proceed with the Work until unsatisfactory conditions have been corrected. Verify that substrates for setting tile are firm, dry, clean, and free from oil laitance, waxy films and curing compounds. Confirm that installation of grounds, anchors, recessed frames, electrical, plumbing and mechanical elements, and similar items located in or behind tiling has been completed prior to beginning the Work.

3.4 INSTALLATION, GENERAL

A. ANSI Tile Installation Standard: Comply with parts of ANSI 108 series of tile installation standards

included under “American National Standard Specifications for the Installation of Ceramic Tile” that apply to type of setting and grouting materials and methods indicated.

B. TCA Installation Guidelines: TCA “Handbook for Ceramic Tile Installation”; comply with TCA installation methods indicated.

C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions except as otherwise shown. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately and neatly form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, drains and other penetrations so that plates, collars, or covers overlap tile. Perform all necessary cutting and fitting of the tile work wherever required in connection with the work as may be necessary to overcome inaccuracies, and to make the materials properly fit and conform to the conditions encountered.

E. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths unless otherwise shown.
   1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so that extent of each sheet is not apparent in finished work. Joints: Not more than 1/16” wide, maintain the standard mounting width of joints between all tile of each sheet and between adjacent sheets of tile.

F. Lay out tile wainscots to next full tile beyond dimensions indicated.
   1. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw cut joints after installation of tiles. Locate joints in tile surfaces directly above joints in concrete substrates.
   2. Prepare joints and apply sealants to comply with requirements of Division 7 Section “Joint Sealers.”

G. Grout tile to comply with the requirements of the following installation standards:
   1. For ceramic tile grouts (sand-portland cement, dry-set, commercial Portland cement, and latex-Portland cement grouts), comply with ANSI A108.10.
   2. All tile shall be grouted in approved manner and to the best practice of the trade. Provide manufacturer’s recommended sealer after grouting.

H. Mortar: Do not use mortar that has reached its initial set. Do not retemper mortar.

I. Adhesives: Install wall tile adhesives using matched trowel to a thickness of not less than 3/16”.

J. Manufacturer's Instructions: Prepare substrates and apply the work of this Section, including components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

3.5 WATERPROOFING FOR THINSET TILE INSTALLATIONS

A. Install waterproofing in compliance with waterproofing manufacturer's instructions to produce a waterproof membrane of uniform thickness bonded securely to substrate.

B. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.6 FLOOR INSTALLATION METHODS

A. Ceramic Mosaic Tile: Install tile to comply with requirements indicated below for setting bed methods, TCA installation methods related to types of subfloor construction, and grout types:
   1. Portland Cement Mortar: ANSI A108.1
      a. Bond Coat: Portland cement paste or dust coat on plastic bed.
      b. Bond Coat: Latex-portland cement mortar on cured bed, ANSI A108.5.
      c. Bond Coat: Dry-set portland cement mortar on cured bed, ANSI A108.5.
      d. Bond Coat: Portland cement paste or dust coat on plastic bed or the following thin-set mortar on cured bed, ANSI A108.5, at Contractor's option:
         i. Latex-portland cement mortar.
      e. Concrete Subfloors, Interior: TCA F111 (cleavage membrane).
      f. Concrete Subfloors, Interior: TCA F112 (bonded).
      g. Concrete Subfloors, Interior, Waterproofing Membrane: TCA F121.
      h. Wood Subfloors, Interior: TCA F141.
      i. Grout: Latex-portland cement.
   2. Organic Adhesive: ANSI A108.4.
      a. Concrete Subfloors, Interior: TCA F116.
      b. Wood Subfloors, Interior: TCA F142.
      c. Grout: Latex-portland cement.
   3. Latex-Portland Cement Mortar: ANSI A108.5.
   4. Dry-Set Portland Cement Mortar: ANSI A108.5.
      a. Concrete Subfloors, Interior: TCA F113.
      b. Cementitious Backer Unit Underlayment, Interior: TCA F144.
      c. Grout: Latex-portland cement.

B. Quarry Tile: Install tile to comply with requirements indicated below for setting-bed method, TCA installation method related to type of subfloor construction, and grout type:
   1. Portland Cement Mortar: ANSI A108.1.
      a. Bond Coat: Portland cement paste or dust coat on plastic bed.
      b. Bond Coat: Latex-portland cement mortar on cured bed, ANSI A108.5.
      c. Concrete Subfloor, Interior: TCA F111 (cleavage membrane).
      d. Concrete Subfloor, Interior: TCA F112 (bonded).
      e. Concrete Subfloor, Interior: TCA F114 (with chemical- resistant resin grout).
      f. Grout: Latex-portland cement.
   2. Latex-Portland Cement Mortar: ANSI A108.5.
      a. Concrete Subfloor, Interior: TCA F113.
      b. Concrete Subfloor, Interior: TCA F115 (with chemical-resistant resin grout).
      c. Grout: Latex-portland cement.

C. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as

abutting field tile unless otherwise indicated.
1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.
2. Comply with TCA TR611, unless otherwise indicated.

D. Stone Thresholds: Bevel stone thresholds to comply with ADA requirements.
1. Bevel by grinding and polish stone threshold- approval of method by Architect.
2. Provide dust and noise control.

3.7 WALL TILE INSTALLATION METHODS

A. Install types of tile designated for wall application to comply with requirements indicated below for setting-bed methods, TCA installation methods related to subsurface wall conditions, and grout types:
a. Portland Cement Mortar: ANSI A108.1. Masonry or Concrete, Interior: TCA W211 (bonded).
b. Solid Backing, Interior: TCA W221 (membrane, lath, and scratch coat).
c. Solid Backing, Interior: TCA W222 (one-coat method).
d. Metal Studs, Interior: TCA W241.
e. Grout: Sand-portland cement.
f. Grout: Latex-portland cement.

B. Organic Adhesive: ANSI A108.4. (for gypsum drywall backing only)
a. Solid Backing, Interior: TCA W223.
b. Gypsum Board, Interior: TCA W242.
c. Grout: Latex-portland cement.

C. Latex-Portland Cement Mortar: ANSI A108.5.
a. Masonry, Interior: TCA W202.
b. Cementitious Backer Units, Interior: TCA W244.
c. Grout: Latex-portland cement.

D. Tile Over Existing Tile Installations: ANSI A136.1.
a. Masonry, Interior: TCA TR713 with epoxy mortar.
b. Grout: Latex-portland cement.

3.8 CLEANING AND PROTECTION

A. Cleaning: Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
1. Remove latex-portland cement grout residue from tile as soon as possible.
2. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer’s printed instructions, but no sooner than 14 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.
3. Clean grout smears and haze from tile according to tile and grout manufacturer’s written instructions but no sooner than 10 days after installation. Use cleaners only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning to insure removal of all cleaning material.

4. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

C. Provide final protection and maintain conditions in a manner acceptable to manufacturer and installer that ensures tile is without damage or deterioration at time of Substantial Completion.
1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy. covering during construction period to prevent staining, damage, and wear.
2. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

E. Leave finished installation clean and free of cracked, chipped, broken, unbonded or otherwise defective tile work.

3.9 MEASUREMENT AND PAYMENT

A. Unit Prices See Bid Sheet

B. For the above systems base all costs upon the Resident Engineer selecting either 1” x 1”, 2” x 2”, 4” x 4” or 6” x 6” ceramic mosaic floor tile and 4-1/4” x 4-1/4” or 2” x 2” wall tile. For color selection guide use products approved equal to American Olean Bright Series for glazed wall tile and Group “A” Series for ceramic mosaic tile.

C. The Contractor shall cut all the tile required under the contract for the work in accordance with the orientation as determined by AM at its own discretion at no additional cost.

D. The Contractor shall layout all the tile required under the contract for the work in accordance with the orientation as determined by AM at its own discretion at no additional cost.

E. DCAS reserves the right to provide materials for installation purposes only as pertains to 09300-1A, 093000-2A, 093000-3A, 093000-4A, 093000-6A, 093000-7A, 093000-8A.

END OF SECTION 093000

SECTION 095113
ACOUSTICAL PANEL
CEILINGS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SUMMARY

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the acoustical ceilings, in quantities needed for repairs or complete ceiling installations, as shown on the drawings and/ or specified herein, including, but not limited to, the following:
   1. Ceilings composed of acoustical panels and exposed suspension grid systems including associated Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.
   2. Acoustical ceiling tile cemented directly to ceiling.
   3. Drywall soffit on suspension system.
   4. Framing and support for light fixtures, air diffusers, registers, and similar items provided under other sections.
   5. Cutting, drilling, scribing and fitting as required for electro-mechanical penetratiions.
   6. Trim and miscellaneous accessories.

1.3 RELATED SECTIONS

A. Metal Decking – Section 053000

B. Cold formed metal framing members that provide additional supplemental framing and support for selected suspended acoustical ceiling grids is specified in Section 054000 “Cold-Formed Metal Framing”

C. Carpentry- Section 062000.

D. Division 9, Section “Gypsum Drywall”

1.4 REFERENCES

A. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
B. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

C. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

D. ASTM C 423- Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2000.

E. ASTM C 635- Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2000.

F. ASTM C 636- Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels; 1996.

G. ASTM C 1338 – Standard Test Method for Fungal Resistance.

H. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

I. ASTM E 84- Standard Test Method for Surface Burning Characteristics of Building Materials; 2000a.

J. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material.

K. ASTM E 580- Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint; 2000.

L. ASTM E 795- Practices for Mounting Test Specimens During Sound Absorption Tests.

M. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems.

N. ASTM E 1264 Classification for Acoustical Ceiling Products.

O. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.

P. ASTM E 1477- Standard Test Method for Luminance Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers; 1998a.

Q. ASHRAE Standard 62.1-2004, "Ventilation for Acceptable Indoor Air Quality"

R. CISCA (AC)- Acoustical Ceilings: Use and Practice; Ceilings & Interior Systems Construction Association; 1999.

1.5 ALTERNATES

A. Prior Approval: Unless otherwise provided for in the Contract documents, proposed product substitutions may be submitted no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability and approved products will be set forth by the Addenda. If included in a Bid are substitute products which have not been approved by Addenda, the specified products shall be provided without additional compensation.

B. Submittals which do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily. limited to, the following: Single source materials suppliers (if specified in Section 1.5); Underwriters' Laboratories Classified Acoustical performance; Panel design, size, composition, color, and finish; Suspension system component profiles and sizes; Compliance with the referenced standards.

1.6 SYSTEM DESCRIPTION

A. Performance Criteria
1. Primary Suspension System Deflection Criteria: Finish to lines and levels shown, with maximum deflection not to exceed 1/360 of the span between supports.
2. Fire Performance Characteristics: Provide acoustical ceilings that are identical to those tested for the following fire performance characteristics, per ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
   a. Acoustical Ceilings: Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
      1) Flame Spread: 25 or less.
      2) Smoke Developed: 50 or less.
3. Minimum Performance Requirements for Acoustic Ceiling Materials: Provide acoustical materials complying with the following performance requirements, unless otherwise shown or specified:
   a. Light Reflectance: ASTM E 1477, 0.75 or more.
   b. Flame Spread: ASTM E84, Flame Spread 25 or less.
   c. Sound Absorption (NRC): ASTM C423, NRC not less than 0.65.
   d. Sound Transmission Class (STC): ASTM E90, not less than 35.
4. Seismic Standard: Provide acoustical ceiling systems, including cold formed metal framing where shown, designed, and installed to withstand the effects of earthquake motions in compliance with the following:
   a. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E580.
   b. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings- Seismic Zones 0-2."
   c. UBC Standard 25-2, "Metal Suspension Systems for Acoustical Tile and for Lay-in Panel Ceilings.

B. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with all pertinent recommendations published by the Ceilings and Interior Systems Contractor’s Association.

C. Qualifications of Installers:
1. The suspended ceiling subcontractor shall have a record of successful installation of similar ceilings acceptable to Architect and shall be currently approved by the manufacturer of the ceiling suspension system.

2. For the actual fabrication and installation of all componenets of the system, use only personnel who are thoroughly trained and experienced in the skills required and completely familiar with the requirements established for this work.

1.7 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

B. Shop Drawings: Coordination drawings for reflected ceiling plans drawn accurately to large scale and coordinating penetrations and ceiling mounted items. Show the following:
   1. Joint pattern
   2. Ceiling suspension members
   3. Method of attaching ceiling hangers to building structure.
   4. Method of attaching ceiling grid to cold formed metal framing members.
   5. Ceiling mounted items including light fixtures; air outlets and inlets; speakers; sprinkler heads; access panels; and special moldings at walls, column penetrations, and other junctures with adjoining construction.
   6. Minimum Drawing Scale: 1/4 inch = 1 foot.

C. Samples for initial selection in the form of manufacturer’s color charts consisting of actual acoustical panels or sections of panels and sections of suspension system members showing the full range of colors, textures, and patterns available for each ceiling assembly indicated.

D. Samples for verification of each type of exposed finish required, prepared on samples of size indicated below. Where finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
   1. 6-inch- (150-mm-) square samples of each acoustical panel type, pattern, and color.
   2. Full-size samples of each acoustical panel type, pattern, and color.
   3. Set of 12-inch- (300-mm-) long samples of exposed suspension system members, including moldings, for each color and system type required.

E. Product test reports from a qualified independent testing agency that are based on its testing of current products for compliance of acoustical panel ceilings and components with requirements.
   1. Laboratory test reports for each acoustical ceiling and wall panel product with specified Noise Reduction Coefficient (NRC) and Sound Transmission Class (STC).
   2. Test Data: Measure volume of air delivered by installed ventilating ceilings. Submit results and calculations showing that the amount of air supplied to the plenum will be delivered through the ventilating ceiling in accordance with the design requirements and that the plenum pressures developed will not exceed the safe load limits for the ventilating ceiling and the system.

F. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction that show compliance of acoustical panel ceilings and components with the building code in effect for the Project.

G. Certification:
   1. Document Review: Before commencing work, submit a written statement signed by the Subcontractor and the Installer certifying that the Contract Documents, shop drawings and

product data have been reviewed with material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.

H. Closeout Submittals: Submit the following for Owner's documentation.
1. Warranties: Special warranties as specified.
2. Maintenance Data: Provide two (2) copies of instructions for maintenance and cleaning of each type of acoustical ceiling panel system.

1.8 QUALITY ASSUARANCE

A. Basis of Design: When particular manufacturers' materials, products or processes are specified for an item of Work, any one thereof is acceptable for the Subcontractor to choose. An alternative material, product or process will be considered if the Subcontractor submits a written substitution request together with such information as may be necessary to assist the Consultant in determining whether the proposed substitution is acceptable, the burden of proof rests solely upon the Subcontractor.

B. Single Source Responsibility: Obtain each type of acoustical ceiling system, for the entire project, from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

C. Installer Qualifications: The acoustical ceiling and wall panel work shall be performed by an experienced Installer who has completed acoustical panel ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance. The firm shall have the approval of the acoustical materials manufacturer.

D. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from such authorities.
1. Provide acoustical ceiling panel components and assemblies which have been approved for installation in the City of New York.
2. Fire-Rated Acoustic Ceiling Assemblies: Provide ceiling assemblies to achieve the fire-resistance classification or rating shown. Comply with the material and installation requirements of the UL "Building Materials List", Guide No. 40 U 18 and other referenced guides for the UL design numbers corresponding with the construction systems shown.
    a. Provide complying protection for recessed light fixtures and other penetrations in ceilings where required for applicable UL approved design.
    b. Provide complying ceiling access units as shown or where required.
3. Fire-Test-Response Characteristics: Where required to maintain fire resistance rating, provide acoustical panel ceilings that comply with the following requirements:
    a. Fire-response tests are performed by a qualified testing and inspecting agency. Qualified testing and inspecting agencies include Underwriters Laboratories (UL), Warnock Hersey, or another agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
    b. Surface-burning characteristics of acoustical panels comply with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.
    c. Acoustical panel ceilings indicated are identical in materials and construction to those tested for fire resistance per ASTM E 119.

d. Fire-resistance-rated, acoustical panel ceilings are indicated by design designations listed in the UL "Fire Resistance Directory," in the Warnock Hersey "Certification Listings," or in the listing of another qualified testing and inspecting agency and as approved for use in New York City.
e. Products are identified with appropriate markings of applicable testing and inspecting agency.

4. Seismic Performance: System seismic performance verified through full-scale testing in accordance with ICC-ES – AC-156 Acceptance Criteria for Seismic Qualification Testing of Non-Structural components.

E. Mock-Up(s)
1. Provide mock-up of each type of acoustical ceiling panel system, including the cold-formed metal framing system required for selected ceiling systems; minimum 100 ft.2 including lighting fixtures, HVAC diffusers, sprinkler heads, speakers and other typical ceiling mounted items, in spaces within the building designated by the Construction Manager. Mock-up(s) shall be representative of the finished work in all respects.
2. Mock-up may be installed in final locations and if accepted, may be utilized in the finished work.

F. Pre-Installation Meeting: Prior to the start of the Work meet at the Project site to review material selections, methods and sequence of installation, special details and conditions, standard of workmanship, quality control requirements, job organization, coordination with other trades, and other pertinent topics related to the Work.

G. Coordination of Work: Coordinate ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Handle acoustical panels to avoid soiling exposed surfaces or damaging surfaces and edges.

C. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.10 PROJECT CONDITIONS

A. Space Enclosure and Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is completed and dry, work above ceilings is complete, and ambient temperature and humidity conditions are being maintained by the permanent mechanical systems at the levels indicated for Project when occupied for its intended use,

B. Maintain temperature within 15 degrees F and relative humidity within 10 percent of design conditions for spaces of installation not less than 48 hours before installation begins and thereafter.

1.11 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system components (if any), and partition assemblies (if any).

1.12 GUARANTEE

A. Acoustical Panel: Submit a 10-year written guarantee executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the guarantee period. Failures include, but are not limited to:
   1. Sagging and warping because of defects in materials or factory workmanship.
   2. Development of odor or stain-causing biological growth in panels with Armstrong BioBlock Plus or designated as inherently resistive to the growth of micro-organisms.

B. Grid System:
   1. Rusting and manufacturer's defects.
   2. Visible sag.

C. The Warranty shall not deprive DCAS of other rights th DCAS may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.13 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, packaged in manufacturer's unopened cartons and identified with labels clearly describing contents. Store at the site where directed.
   1. Acoustical Ceiling Units: Furnish quantity of full-size units equal to 2.0 percent of amount installed, of each type of acoustic tile and acoustic board installed in the Project
   2. Exposed Suspension System Components: Furnish quantity of each exposed component equal to 2.0 percent of amount installed.

PART 2- PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, acoustical panels that may be incorporated in the Work include, but are not limited to, the following:
   1. Armstrong World Industries, Inc.
   2. The Celotex Corporation.
   3. USG Interiors, Inc.
   4. Or an Approved Equal.

2.2 ACOUSTICAL PANELS, GENERAL

A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance, unless otherwise indicated.
   1. Mounting Method for Measuring Noise Reduction Coefficient (NRC): Type E- 400 [plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from the test surface] per ASTM E 795.
   2. Test Method for Ceiling Attenuation Class (CAC): Where acoustical panel ceilings are specified to have a CAC, provide units identical to those tested per ASTM E 1414 by a qualified testing agency.

B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
   1. Where appearance characteristics of acoustical panels are indicated by reference to ASTM E 1264 pattern designations and not to manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range of products that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

C. Panel Characteristics: Comply with requirements indicated on each Acoustical Panel Ceiling Product Data Sheet at the end of this Section, including those referencing ASTM E 1264 classifications.

2.3 ACOUSTICAL CEILING PANELS (FIRE RETARDANT)

A. Install suspension system according to ASTM C-636-76, Recommended Practice For Installation of Metal Ceiling Suspension System For Acoustical Tile and Lay-In panels."

B. Panel Characteristics: Fire retardant fiberboard by "U.S.G. Acoustone," or an approved equal.

C. Color: White, unless otherwise indicated.
   1. Light Reflectance Coefficient: LR-1 (75% or over)
   2. Noise Reduction Coefficient: NRC Range (.50-.60)
   3. Ceiling Sound Transmission Class Range: CSTC 35-39 (Cont. Ceiling 5/8")
   4. Edge Detail: Square Edge, unless otherwise indicated.
   5. Flame Spread: 0-25 ASTM E84, Class A Fed Spec SS-S1188, 25 or under (UL Label)
   6. Insulation Value: Average C Factor, (At 75 F is 64), R Factor is 1.56
   7. Thickness: 5/8 inch, unless otherwise indicated.
   8. Size: 24 by 24 inches, unless otherwise indicated.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635, "Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings" requirements.
   1. Suspension system shall be wide flange type, hung directly from structure above or by means of carrying channels.
   2. Suspension system shall be hung by means of 1-1/2" cold rolled 16-gauge steel #1.475 carrying

channels accurately leveled and placed not over 4’-0” o.c., with first channel not over 10” from wall.

3. The (exposed) “T” grid shall be “snap action” type of 24 gauge (0.025 inch) 1- 1/2” high electro-galvanized steel finish, off-white enameled on exposed 15/16” surfaces. Main slots to form grid for 24” x 24” tiles and lights, unless otherwise indicated. Form grid as shown on drawing (reflected ceiling plan) and constructed so the cross tee may be snapped in place.
4. All metal work used shall be galvanized and/or fully primed and coated to form corrosion resistance. Metal work shall be relocated and/or protected from contact with condensation.
5. Maximum allowable deflection in the ceiling suspension is 1/360 of the span. The manufacturer must furnish and certify deflection data on his suspension system.
6. Ceiling height from finished floor elevation will be established by Architect, or as directed by the Project Manager, and shall be leveled to within one-eighth of an inch in twelve feet (1/8” in 12’-0”).

B. Finishes and Colors: Provide manufacturer’s standard factory-applied finish for type of system indicated. Provide similar material to frame around perimeter walls, light fixtures, air diffusers, registers, etc.

C. Hanger Rods: Mild steel, zinc coated, or protected with rust-inhibitive paint, size and type complying with the New York City Building Code.

D. Flat Hangers: Mild steel, zinc coated, or protected with rust-inhibitive paint, size and type complying with the New York City Building Code.

E. Sheet-Metal Edge Moldings and Trim: Type and profile indicated, or if not indicated, manufacturer’s standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.

1. For lay-in panels with reveal edge details, provide stepped-edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
3. For narrow-face suspension systems, provide suspension system and manufacturer’s standard edge moldings that match width and configuration of exposed runners.

F. Miscellaneous Accessories: All miscellaneous accessories including tempered spring steel spacers, clips, clamps, fastenings, and similar items shall be furnished and installed under this contract as required to ensure the proper installation of all work and to provide a safe rigid and level ceiling with a continuous grid and fully framed around all edges, post columns, etc.

1. All alterations necessary shall be performed to ceiling channels, grid, lights, etc. to keep the ceiling as close as possible to the existing ducts, obstructions, etc. as required, directed, or as approved.
2. Wall moldings shall be installed at intersection of suspended ceiling and vertical surfaces.
3. All perimeter and column edges shall be provided with steel angle or channel trim of similar material and appearance.
4. Provide all necessary alterations and modifications so that the “T” grid system shall frame around the existing ducts, edges, columns, etc. and allow for installation of new diffusers, lights, etc.

5. Splines shall be used as recommended by the tile manufacturer.
6. Tiles shall be laid out symmetrically. Butt all existing raceway, conduit, partition, pipes, canopies, etc., neatly, and tightly to suit all conditions.

2.5 SOFFITS (STEEL FRAMED)

A. Where windows, radiators and/or ducts require alteration to ceiling edges, and ceiling height is indicated on drawings, suspended ceiling shall stop with framed soffit edges constructed with visible edges faced in 5/8" Fire Code 60 gypsum board over 2-1/2" (25 gauge) galvanized steel framing 12" o.c. with entire window/ceiling recess and areas of the wall, radiators and/or ducts, if directed, painted to match the ceiling tile color.

B. The Contractor shall carefully "box in" all ducts and protrusions that come below ceiling height with acoustical tiles applied to lower framed duct surfaces, as directed, and approved.

C. Framing for gypsum board shall connect with or allow for suspension ceiling system and shall be fully independent of duct hangers, conduits, etc., and shall be hung off black iron channel or as approved. The Contractor shall insure these areas are safe, rigid, and consistent with the finest construction practice and reinforced as needed or directed.

2.6 ACOUSTICAL TILE (GLUED)

A. Acoustical tile shall be 12" x 12" units, 3/4" thick, fissured mineral fiber tile having a noise reduction co-efficient of 0.65 - 0.75, manufactured by "Armstrong", or an Approved Equal.

B. The tile shall be on incombustible material and have a flame material spread rating of 0- 25.

C. The units shall be securely spot cemented in place in the standard approved best practice with an adhesive cement such as "Hertzels Acoustiglue", or an approved equal, that has a strength of not less than 1/2 lb. per sq. inch when first applied and a strength not less than 1-1/2 lbs. per sq. inch 24 hours after application.

D. Such adhesive shall be waterproof and resistant to alkaline solutions and of such nature that they remain plastic during and after application.

2.7 GYPSUM BOARD CEILING ON SUSPENDED CEILING

A. As required by the Architect, or as directed by DCAS, a suspended gypsum board ceiling shall be installed either in lieu of an acoustical tile ceiling or as a ceiling design accent. The ceiling shall be installed in accordance with all applicable building and fire codes and taped and finished as described in the "Gypsum Board Assemblies" Section of the Specifications.

B. The Contractor shall furnish and install ceiling fascia as shown on the drawing.

C. The Contractor shall secure 25-gauge channel runners to the underside of slab above and to the wall above the windows. Channel runners shall be 3-5/8" steel manufactured by "Gold Bond", or an

approved equal.

D. Steel studs shall be 3-5/8", 25 gauge, spaced at 16" o.c.

E. Gypsum wall board shall be one layer, 5/8" thick, "Fire Code 60", secured to steel studs with steel screws with rust inhibiting coating.

F. Fascia corner molding shall be extruded alloy 6063T5 with clear anodized finish, # FCM- 75 manufactured by "Fry Reglet" or an approved equal. Fascia and/or soffits shall have one layer of gypsum board, unless otherwise indicated.
   1. All joints shall be neatly fitted, taped with perforated tape, an approved type joint compound shall be applied and tape centered over joints and seated into compound.
   2. Sufficient compound must remain under tape to provide an even and proper bond. Immediately after a skim coat shall follow. After skim coat is thoroughly dry, a fill coat shall be applied, covering tape and feathering out 4 inches on each side of tape.
   3. All fastening and depressions shall be properly taped and topped with compound as required. All screw heads shall be depressed.

G. Finish details and practices shall comply with all applicable provisions of Paragraph 2.4 "Metal Suspension Systems, General" and 2.5 "Soffit (Steel Framed)" of this Section and related Sections, regarding, but not limited to, miscellaneous accessories, grids, soffits, fascia painting, "box-in", ceiling heights, leveling, etc.

2.8 ACOUSTICAL SEALANT

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C 834 and the following requirements:
   1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies per ASTM E 90.
   2. Product has flame-spread and smoke-developed ratings of less than 25 per ASTM E 84.

B. Acoustical Sealant for Concealed Joints: Manufacturer's standard non-drying, non- hardening, non-skinning, non-staining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.

C. Available Products: Subject to compliance with requirements, acoustical sealants that may be incorporated in the Work include, but are not limited to, the following:
   1. Acoustical Sealant for Exposed and Concealed Joints:
      a. AC-20 FTR Acoustical and Insulation Sealant; Pecora Corp.
      b. SHEETROCK Acoustical Sealant; United States Gypsum Company.
      c. Or an Approved Equal.

2.9 ACOUSTICAL CEILING SCHEDULE

A. Acoustical Panels Type-1:
   1. Surface Texture: Medium

2. Composition: Mineral Fiber
3. Color: White
4. Size: 24inch X 24inch X 5/8inch or 24inch X 48inch X 5/8inch
5. Edge Profile: Square Lay-In for interface with Prelude XL 15/16" Exposed Tee.
6. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton, 0.55.
7. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton, 33.
8. Emissions Testing: Protocol, < 13.5 ppb of formaldehyde when used under typical conditions required by ASHRAE Standard 62.1-2004, "Ventilation for Acceptable Indoor Air Quality"
9. Flame Spread: ASTM E 1264; Class A (UL)
10. Light Reflectance (LR): ASTM E 1477; White Panel: Light Reflectance: 0.82.
11. Dimensional Stability: Standard -Space is enclosed, weatherproofed, HVAC systems operating.
12. Antimicrobial Protection: None
13. Acceptable Product: Cortega Tile & Lay-In, Item #770 or #769A as manufactured by Armstrong World Industries or Approved Equal. Suspension Systems Type-1:

B. Suspension Systems Type-1:
1. Components: All main beams and cross tees shall be commercial quality hot-dipped galvanized steel as per ASTM A 653. Main beams and cross tees are double-web steel construction with 15/16-inch type exposed flange design. Exposed surfaces chemically cleansed, capping pre-finished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.
    a. Structural Classification: ASTM C 635 HD.
    b. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
    c. Acceptable Product: Prelude XL 15/16" Exposed Tee as manufactured by Armstrong World Industries, Inc.
    d. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
    e. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of the same width as exposed runner.
    f. Accessories

C. Acoustical Panels Type 2:
1. Surface Texture: Fine
2. Composition: Mineral Fiber
3. Color: White
4. Size: 24in X 24in X 3/4in.
5. Edge Profile: Beveled Tegular for interface Silhouette XL 9/16" Bolt Slot - 1/8" Reveal.
6. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton, 0.70.
7. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton, 35.
8. Emissions Testing: Section 013500 Protocol, < 13.5 ppb of formaldehyde when used under typical conditions required by ASHRAE Standard 62.1-2004, "Ventilation for Acceptable Indoor Air Quality".
9. Flame Spread: ASTM E 1264; Class A (UL).
10. Light Reflectance (LR): ASTM E 1477; White Panel: Light Reflectance: 0.90.

11. Dimensional Stability: HumiGuard Plus - Temperature is between 32°F (0° C) and 120°F (49° C). It is not necessary for the area to be enclosed or for HVAC systems to be functioning. All wet work (plastering, concrete, etc) must be complete and dry.
12. Antimicrobial Protection: BioBlock Plus - Resistance against the growth of mold/mildew and gram positive and gram-negative odor and stain causing bacteria.
13. Acceptable Product: Ultima, 1912 and Silhouette XL 9/16" Bolt Slot - 1/8" Reveal, 76068 as manufactured by Armstrong World Industries or an approved equal.

D. Suspension System Type 2:
1. Components: All main beams and cross tees shall be commercial quality hot- dipped galvanized (galvanized steel, aluminum, or stainless steel) as per ASTM A 653. Main beams and cross tees are double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping pre- finished galvanized steel (aluminum or stainless steel) in baked polyester paint. Main beams and cross tees shall have rotary stitching (exception: extruded aluminum or stainless steel).
   a. Structural Classification: ASTM C 635 HD.
   b. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
   c. Acceptable Product: Silhouette XL 9/16" Bolt Slot - 1/8" Reveal as manufactured by Armstrong World Industries, Inc., Or an Approved Equal.
2. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
3. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of the same width as exposed runner.
4. Accessories

PART 3- EXECUTION

3.1 EXAMINATION

A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Manufacturer's Instructions: Prepare substrates and install the work of this Section, including components, and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

3.2 PREPARATION

A. Coordination: Coordinate layout and installation of acoustical ceiling systems with other construction that penetrates ceilings or is supported by them, including cold-formed metal framing members, light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.
1. Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
2. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.

B. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders and comply with reflected ceiling plans.

3.3 INSTALLATION

A. Codes and Standards: Install materials in accordance with manufacturer's printed instructions, to comply with governing regulations and industry standards, and as referenced below:
   1. Install suspension systems to comply with ASTM C 636, with wire hangers supported only from building structural members. Locate hangers not more than 6" from each end, leveling to tolerance of 1/8" in 12'-0".
   2. Space rod or flat iron (New York City) hangers not more than 4'-0" o.c. along main carrying channels; attach by clips or wire ties to building structure. Locate hangers not more than 6" from each end. Space main carrying channels 4'-0" o.c. Attach suspension system to carrying channels using clips or ties, leveling to a tolerance of 1/8" in 12'-0".
   3. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
   4. CISCA Recommendations for Acoustical Ceilings: Comply with CISCA "Recommendations for Direct-Hung Acoustical Tile and Lay-In Panel Ceilings."

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum which are not part of supporting structural or ceiling suspension system.
   2. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing, reinforcing, counters playing or other equally effective means.
   3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
   4. Secure hangers to ceiling suspension members and to supports above with a minimum of 3 tight turns. Connect hangers either directly to structures or to inserts, eye screws, or other devices that are secure, that are appropriate for substrate, and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
   6. Secure bracing wires to ceiling suspension members and to supports with a minimum of 4 tight turns. Fasten bracing wires to concrete with cast-in-place or post-installed anchors.
   7. Do not support ceilings directly from permanent metal forms. Fasten hangers to cast-in-place hanger inserts, powder-actuated fasteners, or drilled-in anchors that extend through forms into concrete.
   8. Do not attach hangers to steel deck tabs.
   9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
   10. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise shown; and provide hangers not more than 8 inches (200 mm)

from ends of each member.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
   1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
   2. Secure moldings to building construction by fastening through vertical leg. at intervals not over 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.18 mm in 3.66 m). Fasten tight against vertical surfaces. Miter corners accurately and connect securely.
   3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Install acoustical panels:
   1. With undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide neat, precise fit with edges concealed by support of suspension members.
   2. Arrange directionally patterned acoustical panels with pattern running in one direction parallel to axis of space.
   3. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
   4. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
   5. For reveal-edged panels on suspension system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.
   6. Paint the cut panel edges remaining exposed after installation; match color of exposed panel surfaces using coating recommended for this purpose by acoustical panel manufacturer.
   7. Install hold-down clips in areas indicated, in toilet areas and in areas required by governing regulations, or for fire-resistance ratings; space as recommended by panel manufacturer, unless otherwise indicated or required. Space 2’-0: o.c. and on all cross tees.
   8. For ceiling that are patched, use tile size, pattern, color and edge that matches existing adjoining tiles remaining. Run pattern is same direction as existing ceiling.

F. Light fixtures or other ceiling apparatus shall not be supported from main beams or cross tees if their weight causes the total load to exceed the deflection capability of the ceiling suspension system. In such cases the load shall be supported by supplemental hangers furnished and installed by this Section of work.

G. Where fixture or ceiling apparatus installation causes eccentric loading on runners, provide stabilizer bars to prevent rotation.

3.4 ADJUST AND CLEAN

A. Clean exposed surfaces of acoustical ceilings, including trim, edge molding, and suspension members; comply with manufacturer’s instructions for cleaning and touch-up of minor finish

damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.5 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

B. Installation of ceiling systems above shall include suspension system up to 2’ x 4’ to structure above. Installation includes all additional items specified to make the ceiling system complete.

C. DCAS reserves the right to provide materials for installation purposes only.

END OF SECTION 095113

SECTION 096340
STONE FLOORING

PART 1 – GENERAL

1.1 SUMMARY

A. Work included: Provide interior stone restoration in accordance with the Contract Documents. The Work of this Section shall include but not be limited to the following:
   1. Rake out and regrout joints in stonework.
   2. Repair damaged or broken stonework by installing stone "dutchmen" matching the adjoining stone in all respects.
   3. Repair damage in stonework smaller than 2" x 2" by patching with patching compound.

B. Definitions
   1. As used here the term "Dutchman" refers to any new or salvaged stone fitted into
   2. an existing stone.
   3. As used here "plug" refers to a circular dutchman drilled out of existing stone. For the purposes of this Specification, all "plugs" shall be considered "dutchmen."

1.2 QUALITY ASSURANCE

A. The Contractor or subcontractor performing the Work of this Section, must during the last five (5) years prior to bid opening, as a prime contractor or subcontractor have successfully completed in a timely fashion at least two (2) projects similar in scope and type to the required work in this Contract (i.e. interior work on buildings that are considered landmark, landmark quality or buildings of equivalent historical or architectural significance.)

B. All Subcontractors are bound by the same requirements as the Contractor. Subcontractors shall not begin work unless approved by DCAS.

C. Bidders must visit the site beforehand and make themselves thoroughly familiar with specific conditions relating to this Section.

D. The Contractor shall maintain a steady work crew consisting of qualified craftsmen and a full-time foreman who speaks and reads fluent English. The Contractor shall confirm that all workmen under his direction fully understand the requirements of the job.

1.3 SUBMITTALS

A. Test Panels:
   1. Prepare mock-ups of dutchmen repair.
   2. Prepare mock-ups of marble patching.
   3. Provide 3" x 3" x 1" hand samples of all grouting materials color matched to the materials being grouted for approval by DCAS. Resubmit samples until approved.

B. Shop Drawings:
   1. Prepare and submit shop drawings for approval. These drawings shall show all details of

jointing, anchoring and other essential aspects of the work.
2. The Contractor shall be responsible for all field measurements and the preparation of drawings fully defining the conditions for the installation of all new masonry.
3. Shop drawings and setting drawings shall be based upon the Contractor's field verification of existing conditions.

C. Stone Samples and Affidavits: The Contractor shall submit two (2) samples measuring at least 6" x 6" x 1". Provide notarized affidavits from the supplier verifying sufficient quantities of stone on hand to complete all restoration work.

D. Product Literature: The Contractor shall submit copies of manufacturer's latest published literature and instructions for materials specified herein for approval and obtain approval before materials are delivered to the site. Product data shall be submitted on all materials.

1.4 JOB CONDITIONS

A. Protect, using extreme care, surrounding materials and finishes. Products and water used for cleaning of masonry may be harmful to paint finishes, plaster, metal and glass and construction backup materials to remain. Any damage to materials caused by the cleaning process is unacceptable and shall be repaired to the satisfaction of DCAS at no cost to the City.

B. Provide protection from water damage to building, structure, or building contents as required.

C. The Contractor shall provide water disposal and removal systems for work on the interior of the building. Test all water removal systems to assure that drains and systems are functioning properly prior to performing any cleaning operations. The Contractor shall notify DCAS immediately of all drains or systems that are found to be stopped or blocked. Contractor shall repair drains if so, directed by DCAS. Do not begin work of this Section until the drains are in working order.

D. Provide a method to prevent solids such as masonry residue from entering the drains or drain lines. Contractor shall be responsible for cleaning out drains and drain lines that become blocked or filled by residue or other solids because of work performed under this Contract.

E. Decorative metal finishes, fixtures, hardware, plaques, statuary, and plaster paint and glazed finishes, and fabric installations and furnishes shall be protected during the course of masonry cleaning. Selected items shall be removed for storage prior to masonry cleaning.

F. Maintain air and material temperatures to comply with requirements of installation material manufacturers, but not less than 50 deg F (10 deg C) during installation and for seven days after completion.

G. Cold-Weather Requirements for Exterior Stone Flooring: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold- weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

H. Hot-Weather Requirements for Stone Flooring: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602 and with the following:

1. Maintain temperature of materials below 100 deg F (38 deg C).
2. Do not apply mortar to substrates with temperatures of 100 deg F (38 deg C) and above.
3. When the ambient temperature exceeds 90 deg F (32 deg C), fog spray installed stone flooring until damp at least three times a day until flooring is three days old.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.
1. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.
2. Store stone on wood A-frames or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to stone. Ventilate under covers to prevent condensation.

B. Mark stone units, on surface that is concealed after installation, with designations used on Shop Drawings to identify individual stone units. Orient markings on vertical panels, so that they are right side up when units are installed.

C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

PART 2 – PRODUCTS

2.1 MATERIALS FOR INTERIOR MASONRY RESTORATION

A. STONE
1. All Stone shall match adjacent existing Stone in color, texture, and finish. Before matching any Stone specified in this section, a 12” by 12” area of existing Stone to be matched shall be thoroughly cleaned in order to show true color and texture.
2. No Stone components shall be fabricated until color, texture and finish match has been approved by Resident Engineer.
3. Color consistency shall fall within range of samples approved by DCAS.
4. New Marble shall comply with ASTM C 503.
    a. Fabrication: Fabrication of marble shall be in compliance with recommendations of the Marble Institute of America, Inc., (MIA) as published in “Dimension Stone Design Manual III.”
5. New Limestone shall comply with ASTM C 568.
    a. Fabrication: Fabrication of limestone shall be in compliance with recommendations of the Indiana Limestone Institute of America.
6. Finish and Surface: New Stone shall match adjacent existing Stone in finish and surface except as modified herein.
7. Stone Profile:
    a. Thickness of Stone and profile shall exactly match existing adjacent Stone units. Modifications and manufacturer’s recommendations shall be subject to approval by DCAS.
    b. Ends and planes shall be square, dressed uniformly, free of projections, mars, chips or depressions. Tapers as approved.
    c. Holes for anchors shall be diamond cored.
8. Joints and Beds:

a. Joints shall be located only where shown on approved shop drawings.
b. Mortar and grout beds shall exactly match existing sizes.

B. GROUT
1. Materials for grouting and patching shall conform to the following:
   a. White Portland Cement: Type I, ASTM C 150
   b. Portland Cement: Type I or Type II, ASTM C 150
   c. Hydrated Lime: ASTM C-207, Type S
   d. Sand: Clean sharp sand free of loam, silt, soluble salts and organic matter, ASTM C 144.
   e. Water shall be potable, from city mains.
   f. Oxide pigments shall be stable, non-fading, and alkali resistant.
   g. Acrylic admixture shall be Laticrete 4237, as manufactured by Laticrete International, Inc.; or an approved equal.
2. Grout Mixes: Prepare the following mixtures for required joints widths.
   a. For joints up to 1/8” wide: 1 part Portland cement to 1 part fine graded sand.
   b. For joints greater than 1/8” and up to 1/2” wide: 1 part Portland cement to 2 parts fine graded sand.
   c. For joints greater than 1/2” wide: 1 part Portland cement to 3 parts fine graded sand.
3. Mixing of Grout:
   a. Grout ingredients shall be measured carefully so that proportions are con- trolled and maintained throughout all work periods.
   b. Grout shall be mixed in an approved type power operated batch mixer. Mixing time shall be such as to produce a plastic homogeneous mortar, but mixing shall not be less than five minutes, approximately two minutes of which shall be for mixing the dry materials and not less than three minutes for continuing the mixing after water has been added. A minimum amount of water shall be used to produce a workable consistency.
   c. Where grout is required in small batches of less than a cubic yard and the Resident Engineer specifically approves, grout may be mixed by hand in clean wooden or metal boxes prepared for that purpose but not on slabs, sidewalks, etc., provided the methods of mixing and transferring the mortar are approved by DCAS.
   d. Grout shall be placed in final position within two hours of mixing. Retempering of partially hardened material is not permitted.

C. PATCHING MATERIALS FOR STONE REPAIRS:
1. For Marble: Polyester Adhesive: 2-component Akemi Knife Grade Polyester adhesive, manufactured by Akemi Plastics, Inc., Eaton Rapids, MI, or approved equal. Tint the adhesive with Akemi Coloring Paste, using different color tints to gain the color of the existing clean marble.
2. For Limestone: Jahn Restoration M70 colored to match existing limestone, as manufactured by Cathedral Stone Company, Washington, D.C., Or an Approved Equal.

PART 3 – EXECUTION

3.1 GROUTING MARBLE

A. Grouting of Marble shall consist of removal of existing grout in Marble joints, and the insertion of new grout materials. The work shall proceed from the top of the wall downward. Work shall not be considered complete until the Resident Engineer has so notified the Contractor in writing.

B. The Contractor shall protect all adjacent plaster and paint finishes, glass, paint, metals from overspray and run-off.

C. At the Contractor's discretion, joints may be taped before grouting. After grouting operations are complete, the Contractor shall remove all traces of tape and adhesive from the stone.

3.2 SETTING STONE DUTCHMEN

A. "Thin set" mortars for typical conditions shall employ Laticrete 4237. Use "thin set" mortar when the mortar bed is less than 3/8" thick to produce an initially tacky mortar exhibiting high strength properties when set. This mortar is to be set in "bonding" joints only and not in stone course joint work. Keep stone course joints clear for standard pointing mortar.

B. Use Laticrete 3701 for special conditions to produce high strength "thick set" mortar when rough inside or other "bonding" surfaces require mortar to fill greater than 3/8" thick voids. Stone must be temporarily held in place with nylon wedges or other means until the mortar has sufficiently set; Or an Approved Equal.

C. Adhesives for attaching anchors and for direct pinning:
1. All attachments shall be fastened by mechanical locking, in addition to appropriate adhesives and mortars.
2. Where permitted, anchors may be held in place with high modulus, high strength, moisture insensitive, epoxy adhesive.

D. General Method for Dutchman Repair of Stone:
1. All replacement stone for the restoration of all defects indicated on the contract drawings, shall be salvaged stone wherever possible. These repairs involving salvaged and/ or new material (referred to as "Dutchmen") shall vary in overall size but shall not be less than 2" thick under any circumstance. Salvaged and/ or new stone shall be carefully cut and selected to be sound and in good condition, free of defects, cracks, breaks, or other observable defects.
2. Dutchman shall be fastened with stainless steel wire, pins, and anchors, as necessary, designed to facilitate mechanical locking and to prevent possible slippage of the stone. The metal fasteners shall be positioned without weakening the stone in any way.
3. Cement mortar containing "Laticrete" latex emulsion additives shall be used for all setting purposes. All insertions shall be fully dressed on all sides, and carefully fitted to the patch opening, with an allowance of not more than 1/8" buttered joint between front edges. Undercutting shall not weaken the stone in any way. The joints between new and old work shall be finished to match the color and texture of the stone.
4. The surface of the new stone shall be dressed to resemble the appearance, tooling and texture of the adjoining stone by an approved method. All surface dressing of new work shall be done before the stone is set.
5. Protect the adjacent materials during the process of stone restoration. Wipe and rinse any mortar accidentally splashed onto adjacent surfaces immediately. Clean uncured epoxy adhesive immediately with acetone.
    a. Any damage to stone or materials to remain resulting from epoxy and mortar spills shall be restored to the full satisfaction of the Resident Engineers at no additional cost to the City.
6. The face of all new stone dutchmen shall be cleaned following the completion of all setting work. Clean mortar splashes, smears, etc. with scrapers, or by vigorously brushing with stiff natural bristle brushes and potable water. If necessary, clean white sand may be added to the

water. Cleaning shall start at the top of the structure and proceed downward.

3.3 MARBLE SURFACE REPAIR

A. Remove deteriorated stone veins with hand tools. Clean out all the dust and particles and prepare the surfaces in accordance with the recommendations of the patching material manufacturer.

B. Mix a range of color samples to match the variegated colors of the marble to be patched. Submit the samples to DCAS for approval. Do not proceed with the patching until receiving written approval for the color samples.

C. Mix the patching material and apply it in accordance with the written recommendations of the manufacturer.

3.4 EXAMINATION

A. Examine surfaces to receive stone flooring and conditions under which stone flooring will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stone flooring.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of stone flooring.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.5 PREPARATION

A. Vacuum and sweep concrete substrates to remove dirt, dust, debris, and loose particles.

B. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.

C. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.

D. Before setting stone, clean dirty or stained stone surfaces by removing soil, stains, and foreign materials. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

3.6 INSTALLATION, GENERAL

A. Do necessary field cutting as stone is set. Cut lines straight and true, and finish field-cut edges to match shop-cut edges.
   1. Use power saws with diamond blades to cut stone, except for stone that is specified to have rough-split edges.

B. Set stone to comply with requirements indicated. Match stone for color and pattern by using units numbered in sequence as indicated on Shop Drawings.

C. Scribe and field cut stone as necessary to fit at obstructions. Produce neat joints of size specified or indicated.

D. Provide control and expansion joints of widths and at locations indicated. Keep control and expansion joints free of mortar, grout, and other rigid materials.

3.7 INSTALLATION TOLERANCES

A. Variation in Line: For positions shown in plan for edges of flooring, ramps, steps, changes in color or finish, and continuous joint lines, do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 3/8-inch (10 mm) maximum.

B. Variation in Joint Width: Do not vary from average joint width more than plus or minus 1/16 inch (1.5 mm) or one-fourth of nominal joint width, whichever is less.

C. Variation in Surface Plane: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 3/8-inch (10 mm) maximum from level or slope indicated.

D. Variation in Plane between Adjacent Units (Lipping): Do not exceed 1/32-inch (0.8-mm) difference between planes of adjacent units.

3.8 INSTALLATION OF STONE BONDED TO CONCRETE

A. Saturate concrete with clean water several hours before placing setting bed. Remove surface water about one hour before placing setting bed.

B. Apply mortar-bed bond coat to damp concrete and broom to provide an even coating that completely covers the concrete. Do not exceed 1/16-inch (1.5-mm) thickness. Limit area of mortar-bed bond coat to avoid its drying out before placing setting bed.
   1. Place reinforcing wire mesh over concrete, lapped at joints by at least one full mesh and supported so mesh becomes embedded in middle of mortar bed. Hold edges back from vertical surfaces about 1/2 inch (13 mm).

C. Apply mortar bed immediately after applying mortar-bed bond coat. Spread, tamp, and screed to uniform thickness at elevations required for setting stone to finished elevations indicated.

D. Mix and place only that amount of mortar bed that can be covered with stone before initial set. Cut back, bevel edge, and discard material that has reached initial set before stone can be placed.

E. Place stone before initial set of mortar occurs. Immediately before placing stone on setting bed, apply uniform 1/16-inch- (1.5-mm-) thick bond coat to mortar bed or to back of each stone unit.

F. Tamp and beat stone with a wooden block or rubber mallet to obtain full contact with mortar bed and to bring finished surfaces within indicated tolerances. Set each unit in a single operation before initial set of mortar; do not return to areas already set and disturb stone for purposes of realigning finished surfaces or adjusting joints.

G. Rake out joints to depth required to receive grout and pointing mortar as units are set.

H. Point joints after setting. Fill full with mortar type and color indicated. Tool joints flat, uniform, and smooth, without visible voids.

3.9 STONE THRESHOLD INSTALLATION

A. At locations adjacent to stone flooring, install stone thresholds in same type of setting bed as abutting stone flooring unless otherwise indicated.
   1. Set thresholds in thinset mortar to comply with ANSI A108.5 at locations where mortar bed would otherwise be exposed above other adjacent flooring.

B. At locations not adjacent to stone flooring, install stone thresholds in thinset mortar to comply with ANSI A108.5 water-cleanable epoxy adhesive to comply with ANSI A108.4.

3.10 STONE STAIR TREAD AND RISER INSTALLATION

A. Install stone stair treads and risers to comply with "Installation of Stone Bonded to Concrete" Article.

B. Install stone stair treads and risers in thin set mortar to comply with ANSI A108.5 water- cleanable epoxy adhesive to comply with ANSI A108.4.

3.11 ADJUSTING AND CLEANING

A. Remove and replace stonework of the following description:
   1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
   2. Defective joints
   3. Stone flooring and joints not matching approved Samples and mockups.
   4. Stonework not complying with other requirements indicated.

B. Replace in a manner that results in stonework matching approved Samples and mockups, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean stonework as work progresses. Remove mortar fins and smears and grout smears before tooling joints.

D. Clean stonework after setting and pointing grouting are complete. Use procedures recommended by stone fabricator for application types.

3.12 PROTECTION

A. Prohibit traffic from installed stone for a minimum of 72 hours.

B. Protect installed stonework during construction with nonstaining kraft paper. Where adjoining areas require construction work access, cover stonework with a minimum of 3/4- inch (20-mm) untreated plywood over nonstaining kraft paper.

3.13 MEASUREMENT AND PAYMENT

A. Unit Price – SEE BID SHEET

END OF SECTION 096340

SECTION 096519
RESILIENT TILE FLOORING

PART 1 – GENERAL

1.1 SUMMARY

A. Work Included: Provide resilient floor tile in accordance with the Contract Documents. The Work of this Section includes the furnishing of all labor and materials, equipment, and services necessary to install and/ or complete flooring work and related work as shown on the drawings supplied during construction and specified therein. The Work of this Section shall include, but not limited to, the following:
   1. Resilient floor tile, base, and accessories.
   2. Sheet linoleum flooring, base, and accessories.
   3. Resilient Terrazzo Floor Tile

1.2 QUALITY ASSURANCE

A. References: Applicable trade association names and titles of general standards are referred to by accepted abbreviations.

B. Manufacturer: Where possible, provide resilient flooring and accessories as produced by a single manufacturer, including recommended primers, adhesives, sealants, and leveling compounds.

C. Qualifications of Installers: Use only personnel who are thoroughly trained and experienced in the skills required and completely familiar with the requirements established for this work.

D. Fire Test Performance: Unless otherwise indicated, provide resilient flooring having the following classifications or properties when tested in accordance with the standard fire tests referenced below:
   1. Critical Radiant Flux (CRF): Not less than 0.45 watts per sq. cm. per ASTM E 648.
   2. Flame Spread: Not more than 75 as per ASTM E 84.
   3. Smoke Developed: Not more than 450 as per ASTM E 84.
   4. Smoke Density: Not more than 450 as per ASTM E 662.

1.3 RELATED SECTIONS

A. Concrete slab- Section 033000

1.4 SUBMITTALS

A. Product Data: Submit manufacturer’s technical data and installation instructions for each type of resilient flooring and accessory.

B. Samples: Submit samples of each color and pattern of resilient flooring indicating full range of color and pattern. Provide full-size tile units and 12” long sections of flooring accessories for approval by Architect and/ or RE/PM.

C. Certification for Fire Test Performance: Submit manufacturer's certification that resilient flooring complies with required fire test performance and has been tested and meets indicated requirements.

D. Maintenance Instructions: Submit manufacturer's recommended maintenance practices for resilient flooring.

E. Replacement Material: After completion of work, deliver to project site replacement materials from same manufactured lot as materials installed, not less than one box for each 50 boxes or fraction thereof, for each color installed.

1.5 DELIVERY AND STORAGE

A. Deliver materials to the project site in the manufacturer's original unopened containers, clearly marked to indicate pattern, gauge, lot number and sequence of materials.

B. Carefully handle all materials and store in original containers at not less than seventy (70) degrees F for at least forty-eight (48) hours before start of installation.

1.6 JOB CONDITIONS

A. Maintain temperature above 65 deg. F. in spaces to receive resilient flooring for at least 48 hours before, after and during installation. Store materials in spaces where they will be installed for at least 48 hours before beginning installation. Subsequently, maintain temperature above 55 deg. F in areas where work is completed.

B. Install resilient flooring and accessories after other finishing operations, including painting, have been completed. Do not install resilient flooring over concrete slabs until the latter have been cured and are sufficiently dry to achieve bond with adhesive as determined by manufacturer's recommended bond and moisture test.

1.7 GUARANTEE

A. In accordance with Article on "GUARANTEES" of the General Conditions, the Contractor hereby guarantees that all work specified in this Section will be free from defects of materials and workmanship for a period of two (2) years.

B. Furnish a guarantee in the form specified in Article on "GUARANTEES" of the General Conditions.

C. The following types of failure, that are not due to abuse, will be adjudged as defective work:
   1. Damaged, loose, broken or curled tiles or base.

PART 2- PRODUCTS

2.1 MATERIALS

A. Colors and Patterns: As selected by Architect or RE/PM from manufacturer's standards.

B. Vinyl Composition Floor Tile: FS SS-T-312B, type IV; 12” x 12” unless otherwise indicated; Composition 1 - asbestos-free, gage: 1/8”.
   1. Selected Product: Armstrong Stonetex Excelon, as manufactured by Armstrong World Industries. Or an Approved Equal.
   2. The tiles shall be free from defects affecting its serviceability or appearance and the surface shall have a smooth calendared finish free from sand, grid, or lumps. All tile shall be given a wax finish at the factory.
   3. The tiles shall have straight edges and square corners.
   4. All materials shall be delivered in the manufacturer’s sealed package with the labels intact and the seal unbroken.
   5. The tile installed shall match in every aspect the approved samples.

C. Linoleum Sheet Flooring and Base: FS LLL-F-1238A; homogeneous floor covering composed of linseed oil, cork, wood floor, resin binders, dry pigments containing NO asbestos, mixed and calendared onto jute backing; 79” wide sheet, 3.2 mm thick, with bonded jute backing.
   1. Selected Product: Forbo Industries, Marmoleum Dual, Thickness: 3.2 mm thick; Or an Approved Equal.

D. Rubber Flooring
   1. Interlocking tile is a vulcanized rubber mat composed mostly of Reclaimed Rubbers making it a reclaimed flooring product. Molded to a 2ft-by-2ft size is a modular floor tile, 3/8” thick.
   2. Hardness 60 Shore A nominal
   3. Weight: 9lbs. per tile.

E. Wall Base: Provide standard top-set cove base complying with FS SS-W-40; Type II, with matching end stops and preformed or molded corner units, and as follows:
   1. Height: 4” or 6”.
   2. Thickness: 1/8”.

F. Resilient Edge Strips: 1/8” thick, homogeneous vinyl or rubber composition, tapered edge, color as selected from standard colors available; not less than 1” wide.

G. Adhesives (Cements): Waterproof, stabilized type as recommended by flooring manufacturer to suit material and substrate conditions.

H. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.

I. Leveling Compound: Latex type as recommended by flooring manufacturer.

J. Resilient Terrazzo Floor Tile:
   a. Resilient Terrazzo Floor Tile: Marble or granite chips embedded in flexible, thermoset-polyester-resin matrix; electrically nonconductive and chemical, oil, and corrosion resistive, with smooth wearing surface and manufacturer's standard factory-applied, protective urethane coating.
      i. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
         1. Fritz Industries;

2. Or an Approved Equal.

b. Thickness: 1/8-inch (3.0 mm) 3/16 inch (4.8 mm).
c. Size: 12 by 12 inches, 12 by 24 inches, 24 by 24 inches & 36 by 36 inches.
d. Performance Characteristics:
   i. Compressive Strength: 2900 to 5000 psi (20 to 34.5 MPa), ASTM C 109/C 109M or ASTM D 695.
   ii. Abrasion Resistance: Maximum 0.0196 cubic centimeters volume loss, ASTM F 510, Taber abrader, S-39 wheels, at 500 cycles with 1000-gram load.
   iii. Static Load Limit: 0.0007-inch (0.0177-mm) maximum indentation, STM F 970 at 125 lb. (57 kg).
   iv. Resin Matrix Hardness: Not less than 78, as measured using Shore, Type D durometer per ASTM D 2240.
   v. Colors and Patterns: Match Architect's sample as selected by Architect from full range of industry colors.

PART 3- EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where resilient tile flooring is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 CONDITION OF SURFACES

A. Allowable Variations in Substrate Levels (Floors): ± 1/8" in 10'-0" distance and 1/4" total maximum variation from levels shown.
B. Grind or fill concrete and masonry substrates as required to comply with allowable variation.

3.3 PREPARATION

A. Broom clean or vacuum surfaces to be covered and inspect subfloor. Start of flooring installation indicates acceptance of subfloor conditions and full responsibility for completed work.

B. Use leveling compound as recommended by flooring manufacturer for filling small cracks and depressions in subfloors.

C. Perform bond and moisture tests on concrete slabs to determine that concrete surface is sufficiently cured, dried and ready to receive flooring.

D. Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive. Apply in compliance with manufacturer’s directions. Inspect substrate and make other required corrections prior to staring installation.

E. Etch concrete substrate as may be required to remove curing compounds or other substances that would interfere with proper bond of adhesive for tile. Rinse with water to remove all traces of treatment.

F. Concrete Primer: Apply concrete slab primer if recommended by tile manufacturer, prior to application of the adhesive. Apply in compliance with manufacturer's directions.

3.4 INSTALLATION, GENERAL

A. Where movable partitions are shown, install resilient flooring before partitions are erected.

B. Install flooring in strict compliance with manufacturer’s recommendations. Extend flooring into toe spaces, door reveals and into closets and similar openings.

C. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other non-permanent marking device.

D. Install flooring on recessed covers within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these items. Tightly cement edges to perimeter of floor around such items.
   1. Unless otherwise directed lay out tiles in basket weave pattern with grain direction alternating between reversed and adjacent tiles.

E. Tightly cement flooring to subbase without open cracks or other surface imperfections. Hand roll flooring at perimeter of each covered area to assure adhesion. Prior to installation, review patterns, direction, starting points, borders and other layout conditions with the RE/PM.

F. Install tile only after all finishing operations, including painting, have been completed and permanent heating system is operating. Moisture content of concrete slabs, building air temperature and relative humidity must be within limits recommended by tile manufacturer.

3.5 FLOORS

A. Unless otherwise directed, lay tile from center marks so those tiles at opposite edges of room are of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to room axis. Place tile units with adhesive cement in strict compliance with the manufacturer's recommendations. Butt tile units tightly to vertical surfaces, thresholds, nosing and edgings. Scribe around obstructions and to produce neat joints, laid tight, even and in straight, parallel lines. Extend tile units into toe spaces, door reveals, and into closet and similar openings.

B. Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packaged if so numbered. Cut tile neatly around all fixtures. Broken, cracked, chipped, or deformed tiles are not acceptable. Lay tile with grain in one direction or as directed by the RE/PM.

C. Adhere tile flooring to substrates using full spread of adhesive applied in compliance with flooring manufacturer’s directions.

D. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on the finish tile as marked in the subfloor. Use chalk or other non-permanent marking devices.

E. Lay tile from center marks established with principal walls, discounting minor off-sets, so that tile at opposite edges of the room are of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to room axis, unless otherwise shown.

F. Tightly cement tile to sub-base without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks through tile, or other surface imperfections.

G. Lay tile with grain in all tiles running in the same direction.

H. Bases: In all spaces where base is indicated, install bases tight to walls, partitions, columns, built-in cabinets, etc., without gaps at top or bulges at bottom, with tight joints and flush edges, with molded corner pieces at internal and external corners. Provide end stops adjacent to flush type door frames and where base does not terminate against an adjacent surface. Keep base in full contact with walls until adhesive sets.

3.6 ACCESSORIES

A. Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required. Install base in lengths as long as practicable, with molded corners. Tightly bond base to substrate at horizontal and vertical surfaces.

B. On masonry surfaces, or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer’s recommended adhesive filler material.

C. Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed.

D. Provide metal or vinyl edge moulding as binder bar, stair nosing, reducer strips, etc. as directed. Approval by the Architect or RE/PM for the edge moulding is required before installation.

3.7 RESILIENT TILE FLOORING AT COURTROOM

A. At courtroom flooring at the Judge’s Bench, Stenographer Station, Witness stand and Jury Box, the flooring shall have lining felt equal to Congoleum Nairn’s SU-1 duplex felt.

B. Felt shall be cemented to the plywood subfloor and shall be installed so that the seams are at right angles to the plywood.

3.8 CLEANING AND PROTECTION

A. Remove any excess adhesive or other surface blemishes, using neutral type cleaners as recommended by flooring manufacturer. Protect installed flooring with heavy Kraft paper or other covering.

B. After completion of project and just prior to final inspection of work, thoroughly clean floors and accessories.

C. Apply polish and buff, with type of polish, number of coats, and buffing procedures in compliance with flooring manufacturer's instructions.

D. Finishing: After completion of the project and just prior to the final inspection of the work, thoroughly clean tile floors and accessories. Apply two (2) coats of wax and buff using materials as specified herein.

3.9 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

B. For resilient floor tile installations, the surface preparation, resilient base and accessories shall be included in the cost of resilient tile work and deemed included in the Unit Price.

C. DCAS reserves the right to provide materials for installation purposes only as pertains to 096519-1A, 096519-2A, 096519-3A, 096519-4A.

END OF SECTION 096519

SECTION 096623
TERRAZZO FLOORING

PART 1- GENERAL

1.1 SUMMARY

A. Section includes:
   1. Epoxy terrazzo with divider and accessory strips.
   2. Precast terrazzo units.

1.2 DEFINITIONS

A. NTMA: National Terrazzo and Mosaic Association, Inc.

1.3 PREINSTALLATION MEETINGS

A. Pre installation Conference: The General Contractor shall conduct a conference at project site before Terrazzo Contractor begins installation.
   1. The General Contractor shall invite Terrazzo Contractor, the Architect, and representatives of the Owner.
   2. Review methods and procedures related to terrazzo including, but not limited to, the following:
      a. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
      b. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.
      c. Review terrazzo mixes and patterns.
      d. Review custom terrazzo mixes, designs, and patterns.
      e. Coordination with the work of other installers.

1.4 ACTION SUBMITTALS

A. Product Data: Terrazzo Contractor shall submit Product Data for each type of product required for installation including:
   1. Strip materials.
   2. Sealer.

B. Shop Drawings: Terrazzo Contractor shall prepare and submit Shop Drawings that include plans, elevations, sections, component details and attachments to other work. Include terrazzo installation requirements. Show layout of the following:
   1. Divider strips.
   2. Expansion joint strips.
   3. Accessory strips.
   4. Abrasive strips.
   5. Stair treads, risers, and landings.
   6. Terrazzo patterns.

C. Samples:
   1. Terrazzo Contractor shall prepare and submit a maximum of three samples, sizes 6 by 6 inches for each color and type of terrazzo specified.

D. Samples for Initial Selection: Terrazzo Contractor shall submit NTMA "Color Palette Brochure" showing full range of colors and patterns available for each terrazzo type.

E. Samples for Verification: Terrazzo Contractor shall prepare and submit samples for each type, material, color and pattern of terrazzo and accessory required showing the full range of color, texture and pattern variations expected.
   1. Terrazzo: 6 by 6-inch samples
   2. Accessories: 6-inch-long Samples of each type and kind of exposed strip item required

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: Terrazzo Contractor shall submit two copies of qualification data.
   1. Include list of projects indicating name and location of project, name of Owner, name and contact information for General Contractor, and name and contact information for Architect.
   2. Include letter from NTMA with the name of the Project and name of member, stating current member status.

B. Material Certificates:
   1. Epoxy Resin: For each type of resin required indicating that materials meet specification requirements, by manufacturer.
   2. Aggregate: For each type of aggregate required indicating compatibility with terrazzo mix, signed by aggregate supplier.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Literature: Terrazzo Contractor shall submit two copies of maintenance recommendations from NTMA.

1.7 QUALITY ASSURANCE

A. Acceptable Epoxy Resin Manufacturer: An Associate Member of the NTMA, experienced in manufacturing epoxy resin in accordance with NTMA standards and with a record of successful in-service performance as well as sufficient production capacity to produce required materials.

B. Acceptable Terrazzo Contractor: A Contractor Member of NTMA whose work has resulted in construction with a record of successful in-service performance.
   1. Installer shall have completed terrazzo installations within the past 5 years of scale and complexity like the proposed installation.

C. Source Limitations for Aggregates: Terrazzo Contractor shall obtain each color, grade, type and variety of granular materials from sources with resources to provide materials of consistent quality in appearance and physical properties.

D. Mockups: Terrazzo Contractor shall construct mockup if required in bid or scope of work documents to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockup as indicated on Drawings.
   2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to Project site in supplier's original wrappings and containers, labeled with source or manufacturer's name, material or product brand name, and lot number if any.

B. Materials shall be stored in their original, undamaged packages and containers, in a location where they will not be exposed to direct sunlight.
   1. Epoxy components shall be stored in a space where the ambient temperature can be maintained 60 and 90 deg. F before use.

1.9 Project Conditions

A. General Contractor shall provide sufficient water, temporary heat and light, and adequate electric power with suitable outlets connected and distributed for use within 100 feet of any working space.

B. General Contractor shall provide temporary enclosures and other suitable methods to protect adjacent spaces from damage during installation.
   1. Maintain ambient temperatures in the area to receive terrazzo at not less than 60 deg. F.
   2. Maintain adequate ventilation in the area to receive terrazzo.

C. Terrazzo Contractor shall protect other adjacent work from water and dust generated by grinding operations.

1.10 GUARANTEE

A. Two years from date of substantial completion of terrazzo installation.

PART 2- PRODUCTS

2.1 PERFORMANCE

A. Epoxy Resin:
   1. Test Specimens: Mix resin materials according to manufacturer's recommendation without aggregate added and cure for 7 days at 75 degrees plus or minus 2 deg. F and 50 percent plus / minus 2 percent relative humidity.
   2. Cured test specimens shall meet or exceed the following requirements:
      a. Hardness: 60 to 85 per ASTM D 2240, Shore D.
      b. Minimum Tensile Strength: 3000 psi per ASTM D 638 for a 2-inch specimen made using

a “C” die per ASTM D 412.

c. Minimum Compressive Strength: 10,000 psi per ASTM D 695, Specimen B cylinder.

d. Chemical Resistance: No deleterious effects by contaminants listed below after seven-day immersion at room temperature per ASTM D 1308.

e. Distilled Water.

3. Mineral Water.
4. Isopropanol.
5. Ethanol.
6. Soap solution at 1 percent.
7. Sodium hydroxide at 10 percent solution.
8. Hydrochloric acid at 10 percent solution.
9. Hydrochloric acid at 30 percent solution.
10. Detergent Solution at 0.025.
11. Acetic Acid at 5 percent solution.

B. Epoxy Resin with Aggregate:

1. Test Specimens:
   a. Mix epoxy resin according to manufacturer's recommendations and blend one volume of epoxy resin with 3 volumes of marble aggregate, consisting of:
      1) 60 percent No. 1 chip.
      2) 40 percent No. 0 chip.
   b. Grind and grout with epoxy resin finished to a nominal 1/4 inch thickness.
   c. Cure specimens 7 days at 75 deg. F plus / minus 2 deg. and 50 percent plus / minus 2 percent relative humidity.
2. Cured epoxy terrazzo specimens shall nominally meet the following requirements:
   a. Flammability: Self- extinguishing, extent of burning 1/4 inch maximum according to ASTM D 635.
   b. Coefficient of Linear Thermal Expansion: 0.0025 inch/inch per deg F for temperature range of minus 12 to plus 140 deg F per ASTM D 696.

C. Bond Strength of Epoxy Terrazzo: 300 lb. failure according to field test method for surface soundness and adhesion as described in ACI Committee No. 403 Bulletin.

2.2 MATERIALS

A. Epoxy Resin Matrix: Two-component, high solids product complying with specified performance requirements.

1. Color: As required for mix indicated.

B. Primer: As recommended, manufactured, and supplied by epoxy resin manufacturer.

C. Aggregates: [Marble, glass, synthetic, and metal.

1. Comply with NTMA gradation standards.
2. Abrasion and Impact Resistance: Loss of 40 percent or less when tested according to ASTM C 131 (LA Abrasion).
3. Aggregates shall contain no deleterious or foreign matter.

D. Divider Strips:
   1. Material: Aluminum
   2. Strip Thickness: 16 gauge.
   3. Type: “L” strip: 3/8 inch by 1/2 inch.

2.3 Miscellaneous accessories

A. Sealer: Terrazzo Contractor shall provide a non-ambering, clear sealer that is chemically neutral; does not impair terrazzo aesthetics or physical properties; is recommended by terrazzo matrix manufacturer. Sealers shall comply with the following:
   1. Comply with requirements of authorities having jurisdiction.
   2. Comply with ASTM D 2047.
   3. Water Based Sealer Properties: With pH factor between 7 and 10.

B. Moisture Mitigation: Two-component, high solids, moisture tolerant, high density, low odor, epoxy-based product produced by epoxy terrazzo resin manufacturer specifically recommended to reduce alkalinity levels and moisture emission to acceptable levels.

2.4 MIXES

A. Terrazzo Selection: Terrazzo Contractor shall provide standard terrazzo mix(es) according to the following:
   1. NTMA Plate No.
   2. Mix Color: As selected by Architect from NTMA color plates.
   3. Custom Mix Color and Pattern:
      a. Color No. 1:
         1) Epoxy Resin Color:
         2) Chips: No. 1, x percent
         3) Chips: No. 1, x percent
         4) Chips: No. 1, x percent
      b. Color No. 2:
         1) Epoxy Resin Color:
         2) Chips: No. 1, x percent
         3) Chips: No. 1, x percent
         4) Chips: No. 1, x percent
      c. Color for Base:
         1) Epoxy Resin Color:
         2) Chips: No. 1, x percent
         3) Chips: No. 1, x percent
         4) Chips: No. 1, x percent

B. Proportions for Epoxy Terrazzo Topping: Comply with resin supplier’s recommendations.

C. Mixing of Terrazzo Topping: Mix epoxy components with aggregates in accordance with manufacturer's recommendations.

PART 3- EXECUTION

3.1 EXAMINATION

A. The General Contractor and Architect shall examine substrates and areas, with Terrazzo Contractor present, for compliance with requirements for installation tolerances and other conditions affecting performance of the work.
   1. Slab Flatness Tolerance: Subfloor is not to vary more than 1/4 inch from true plane in a 10-foot span.
   2. Cracks: Locate cracks and joints in concrete substrates. Verify location of control joints and expansion joints in epoxy terrazzo flooring.
      a. If required to prevent cracks in concrete substrates transmitting through epoxy terrazzo flooring, the Terrazzo Contractor shall make a written recommendation to install a crack suppression membrane and include specific recommendations on type and location.

B. The General Contractor shall retain the services of an independent testing laboratory to verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to epoxy resin manufacturer's written instructions.
   1. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
   2. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of 3 lbs. of water/1000 sq. ft. of slab area in 24 hours.
   3. If required to prevent moisture vapor transmission in concrete substrates, the Terrazzo Contractor shall make a written recommendation to install moisture mitigation materials and include specific recommendations on type and location.

C. The General Contractor shall be responsible for correcting non-conforming concrete substrates using materials compatible with epoxy terrazzo flooring system and as approved by the Terrazzo Contractor.
   1. Materials used to correct nonconforming conditions must be compatible with the selected epoxy system and be approved by the manufacturer of epoxy resin materials and Terrazzo Contractor.

D. Terrazzo Contractor shall proceed with installation only after unsatisfactory conditions, including levelness tolerances, cracking, excessive moisture vapor transmission, and alkalinity have been corrected.

3.2 PREPARATION

A. General Contractor shall broom clean area to receive terrazzo to remove loose chips and all foreign matter.

B. Terrazzo Contractor shall mechanically abrade concrete surface.

C. Terrazzo Contractor shall provide moisture mitigation materials according to instructions and recommendations of moisture mitigation materials manufacturer. Cost for moisture mitigation materials and installation shall be included as an Alternate, included as a Unit Cost, and an additional cost to the Owner under an approved Change Order.

D. Terrazzo Contractor shall provide flexible epoxy crack isolation/suppression membrane: Cost for materials and installation for installation over not more than five percent of the floor area receiving epoxy terrazzo shall be included in the Base Bid. Cost for additional materials and installation for installation included as an Alternate, included as a Unit Cost, an additional cost to the Owner under an approved Change Order.

3.3 POURED-IN-PLACE TERRAZZO INSTALLATION

A. Strip Materials: Terrazzo Contractor shall install strip materials as follows:
   1. Divider and Control-Joint Strips:
      a. Locate divider strips in locations indicated.
      b. Install control joint strips back-to-back in locations indicated.
      c. Install strips in epoxy adhesive without voids below strips.
   2. Accessory Strips: Install as required to provide a complete installation.

B. Placing Terrazzo:
   1. Prime subfloor in accordance with manufacturer's recommendations.
   2. Proportion and thoroughly blend the materials.
   3. Place mixture to achieve specified thickness.

C. Poured in Place Terrazzo Base: Terrazzo Contractor shall provide mix color for terrazzo base to match approved mockup.
   1. Terrazzo Contractor shall place and finish terrazzo base at the same time the terrazzo floor is being installed.

D. Finishing: Terrazzo Contractor shall finish the terrazzo topping as follows:
   1. Rough Grinding:
      a. Grind with 24 or finer grit stones or with comparable diamond abrasives.
      b. Follow initial grind with 60/80 grit stones or with comparable diamond abrasives.
   2. Grouting:
      a. Clean terrazzo with clean water and rinse. Allow to dry.
      b. Apply epoxy grout per manufacturer's instructions.
      c. Allow grout to cure.
   3. Fine Grinding/Polishing: Grind with 120 grit or with comparable diamond abrasives until all grout is removed from surface.

E. Terrazzo Cleaning: Terrazzo Contractor shall clean finished terrazzo as follows:
   1. Remove grinding residue from terrazzo surface.
   2. Wash terrazzo surfaces immediately after final grinding of terrazzo flooring with water and allow surfaces to dry thoroughly.

F. Sealing: Terrazzo Contractor shall seal terrazzo according to sealer manufacturer’s written instructions.

3.4 REPAIR

A. Terrazzo Contractor shall repair terrazzo areas that evidence lack of bond between topping and underbed according to NTMA's written recommendations.

3.5 PROTECTION

A. After application of the sealer, the Work shall be ready for final inspection and acceptance by the Owner or his agent.

B. The General Contractor shall protect the finished floor after the Terrazzo Contractor has completed final grinding and applied sealer to terrazzo surfaces.

END OF SECTION 096623

SECTION 096800
CARPETING

PART 1- GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SUMMARY

A. Work Included: Provide carpet in accordance with the Contract Documents. The Work of this Section includes the furnishing of all labor and materials necessary and required for the installation of carpeting on the floor as indicated on the drawing furnished during construction and specified herein. The Work of this Section shall include, but not be limited to, the following:
   1. Carpet, carpet cushion and carpet molding.
   2. Carpet tile and carpet molding.

A. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 2 Section for removing existing flooring.
   2. Division 3 Sections for curing compounds and other concrete treatments compatible with carpet and carpet cushion adhesives.
   3. Division 9 Section “Resilient Tile Flooring” for materials and installation.

1.3 REFERENCES

A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.

B. Carpet and Rug Institute (CRI)
   1. "The Carpet Specifier’s Handbook".
   2. CRI 104 "Standard Installation of Commercial Textile Floor Covering Materials" excluding references not specified herein.
   3. Carpet Cushion Council (CCC): “Commercial Carpet Cushion Guidelines”.

C. American Society for Testing and Materials (ASTM)
   1. ASTM E648, “Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat energy Source.
   2. ASTM D2859, “Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials”.

D. Consumer Product Safety Commission (CPSC): CPSC 16 CFR, Part 1630, “Standard for the Surface Flammability of Carpet and Rugs”.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who is certified by the Floor Covering Installation Board (FCIB) or who can demonstrate compliance with FCIB certification program requirements.

B. Manufacturer Qualifications: Firm (carpet mill) with not less than five (5) years of production experience with carpet similar to types specified in this Section; and whose published product literature clearly indicates general compliance of products with requirements of this Section.

C. Single-Source Responsibility: Obtain each type of carpet from one source and by a single manufacturer. Each roll of carpet and/ or box of carpet tile shall be from the same dye lot.

D. Carpet Fire-Test-Response Characteristics: Provide carpet with the following fire-test- response characteristics as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify carpet with appropriate markings of applicable testing and inspecting agency.
   1. Surface Flammability: Passes CPSC 16 CFR, Part 1630.
   2. Flame Spread: Class 1, 25 or less per ASTM E 84.
   3. Smoke Developed: 450 or less per ASTM E 84.

E. Carpet Cushion Fire-Test-Response Characteristics: Provide carpet cushion with the following fire-test-response characteristics as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify carpet cushion with appropriate markings of applicable testing and inspecting agency.
   1. Surface Flammability: Passes CPSC 16 CFR, Part 1630.
   2. Flame Spread: Class 1, 25 or less per ASTM E 84.
   3. Smoke Developed: 450 or less per ASTM E 84.

F. Carpet shall be soil resistant, dense and durable to give optimum performance in highly trafficked areas. Carpet shall be static resistant and shall comprise materials for superior stability.

G. The Contractor shall adhere to NYC Administrative Code Title 6, Chapter 3, Subchapter 5, §6-313 “Volatile organic compounds and other airborne hazards” for all materials used in conjunction with this Section.

H. General Terminology/ Information Standard: Refer to current edition of "Carpet Specifier's Handbook" by The Carpet and Rug Institute (CRI); for definitions of terminology not otherwise defined herein, and for general recommendations and information.

I. Installation methods and procedures must meet standards of CRI Installation Manual.

J. Testing Agency: Agency shall be independent and qualified to perform concrete substrate moisture and humidity testing according to ASTM F710 prior to the flooring being installed.

1.5 Preconstruction Testing

A. Concrete substrate: Reference Standard ASTM F710 for more detail. To partially summarize here, regardless of its age or grade level or history of use, perform the following concrete tests:
   1. Concrete Moisture Test: Perform moisture tests (ASTM F1869 and ASTM F2170) on concrete

with a minimum of three tests for the first 1000 square feet and one additional test for each 1000 square feet or fraction thereof. A diagram of the area showing the location and results of each test shall be dated and submitted to the architect, general contractor, and/ or end user. If test results exceed the floor covering manufacturer's limits, installation shall not commence until results conform to limits.

2. If test results on indoor installations* exceed the following limits, installation shall not commence until results conform to limits:
    a. Concrete pH Test: Perform pH tests on concrete. Readings below 7.0 and above 10.0 can adversely affect resilient flooring or adhesives, or both.

B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from authorities having jurisdiction.

C. Pre-Installation Meeting: Prior to the installation, meet at the project site to review the material selections, substrate preparations, installation procedures, coordination with other trades, special details and conditions, standard of workmanship, and other pertinent topics related to the Work.

D. Carpet used on Project must be from same dye lot for each carpet type.

E. Carpet shall have a minimum 25% post-consumer recycled content by weight.

1.6 SUBMITTALS

A. Product Data for each type of carpet material, carpet cushion, and installation accessory specified. Submit manufacturer's printed literature, specifications and installation instructions describing the general properties of each material and accessory to be used in the Work and other data as may be required to show compliance with the Contract Documents including data on physical characteristics, durability, fade resistance, and fire- test-response characteristics. Submit methods of installation for each type of substrate.

B. Shop Drawings showing columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet. Include on shop drawings dimensions which verify field conditions. Indicate the following:
1. Carpet type, color, and dye lot.
2. Locations where dye lot changes occur.
3. Seam locations, types, and methods.
4. Tiling layout, start points,
5. Type of subfloor.
6. Type of installation.
7. Pattern type, repeat size, location, direction, and starting point.
8. Pile direction.
9. Type, color, and location of insets and borders.
10. Type of cushion
11. Type, color, and location of edge, transition, and other accessory strips.
12. Transition details to other flooring materials.

C. Schedule of carpet using same room designations indicated on Drawings.

D. Samples for initial selection in the form of manufacturer's color charts or Samples of materials showing the full range of colors, textures, and patterns available for each type of carpet indicated.

E. Samples for verification of the following products, in manufacturer's standard sizes, showing the full range of color, texture, and pattern variations expected. Prepare Samples from the same material to be used for the Work. Label each sample with manufacturer's name, material type, color, pattern, and designation indicated on Drawings and carpet schedule. Samples will be reviewed for color and appearance only. Compliance with other requirements is the responsibility of the Subcontractor. Where piece dyed, submit sample from actual dye lot for approval prior to shipping finish carpet tiling to the site. Prepare samples from same material to be used for the Work. Submit the following:
   1. 12-inch- (300-mm-) square Samples of each type of carpet material required.
   2. 12-inch (300-mm) Samples of each type of exposed edge stripping and accessory item.
   3. 6-inch (150-mm) Samples of each type of carpet cushion.

F. Production Samples: At beginning of carpet tiling production, provide one (1) yd2 of each first production run for verification of specified products.

G. Mock-Up(s)
   1. Before installing carpet tiling, install mock-up(s) for each type of carpet tile installation required to demonstrate aesthetic effects and qualities of materials and execution. Install mockup(s) to comply with the specified requirements, using materials indicated for the completed Work.
   2. Install mock-up(s) in the location and of the size indicated or, if not indicated, as directed by consultant. Notify Consultant seven days in advance of dates and times when mockups will be installed.
   3. Demonstrate the proposed range of aesthetic effects and workmanship. Obtain approval of mock-up(s) before starting work. Maintain mock-up(s) during construction in an undisturbed condition as a standard for judging the completed Work.
   4. Approved mock-up(s) may become part of the completed Work if undamaged at time of Substantial Completion
   5. Certification: Submit manufacturer's certification stating that carpet materials furnished comply with specified requirements.
   6. Include listing of mill register numbers for carpet furnished.
   7. Include supporting certified laboratory test data indicating that carpet meets or exceeds specified test requirements.
   8. Maintenance data for carpet and cushion: Submit manufacturer's printed maintenance recommendations for maintaining carpet in optimum conditions under anticipated traffic and use conditions. Include the following:
   9. Methods for maintaining carpet and carpet cushion, including manufacturer's recommended frequency for maintaining carpet.
   10. Precautions for cleaning materials and methods that could be detrimental to finishes and performance. Include cleaning and stain-removal products and procedures.

1.7 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with the Carpet and Rug Institute's CRI 104, Section 5: "Storage and Handling."

B. Deliver materials to Project site in original factory wrappings and containers, labeled with identification of manufacturer, brand name, and lot number and with mill register numbers and tags

attached. Comply with CRI 104 Section 5.2 for handling requirements. Deliver other materials in manufacturer's unopened containers identified with name, brand type, grade, class and other qualifying information.

C. Store materials on-site in original undamaged packages, in a dry, well-ventilated area protected from weather, moisture, soilage, extreme temperatures, and humidity. Comply with CRI 104 Section 5.1 for storage requirements. Protect adhesives from freezing. Follow manufacturer's recommendations for minimum temperatures to which adhesives are exposed.

1.8 PROJECT/ SITE CONDITIONS

A. General: Comply with CRI 104, Section 6: "Site Conditions."

B. Requirements: Comply with CRI 104, Section 7.2, "Site Conditions; Do not install carpet until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.

C. Subfloor Moisture Conditions: Substrate Requirements: Do not install carpet over concrete substrate until concrete has cured and is sufficiently dry to bond with adhesive, with a moisture emission rate of not more than 3 lb/1000 sq. ft. /24 hours (14.6 kg/1000 sq. m/24 hours) when tested by calcium chloride moisture test in compliance with CRI 104, 6.2.1, with subfloor temperatures not less than 55 deg F (12.7 deg C).

D. Subfloor Alkalinity Conditions: Do not install carpet over concrete substrate until concrete slabs have pH range a pH range of 5 to 9 when subfloor is wetted with potable water and pHydrion paper is applied, or as recommended by carpet tile manufacturer.

E. Where demountable partitions or other items are indicated for installation on top of carpet tile, install carpet tile before installing these items.

1.9 GUARANTEES

A. General Guarantee: The special guarantee specified in this Article shall not deprive DCAS of other rights DCAS may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other guarantees made by the Contractor under requirements of the Contract Documents.

B. Special Carpet Guarantee: Submit a written guarantee executed by carpet manufacturer and Installer agreeing to repair or replace carpet that does not meet requirements or that fails in materials or workmanship within the specified guarantee period. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination. The Guarantee Period is five (5) years and shall commence upon final acceptance of the Work.

C. Special Carpet Cushion Guarantee: Submit a written guarantee executed by carpet cushion manufacturer and Installer agreeing to repair or replace carpet cushion that does not meet requirements or that fails in materials or workmanship within the specified guarantee period. Failures include, but are not limited to, permanent indentation or compression. The Guarantee Period is five (5) years and shall commence upon final acceptance of the Work.

D. The contractor shall guarantee in writing to relay or restretch any carpet that does not provide an attractive, wrinkle-free appearance and to correct any condition due to faulty installation which may appear within two (5) years after Substantial Completion of the Project including loss of adhesive to the subfloor, frayed open or raveled seams.

1.10 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
   1. Carpet: Before installation begins, furnish quantity of full-width units equal to 5 percent of amount installed.
   2. Carpet Tile: Before installation begins, furnish quantity of full-size units equal to 5 percent of the amount installed.

B. All carpet remnants 1 square yard or larger should be left at the job site or packaged in appropriate wrapping, labeled, and delivered to the building custodian.

PART 2- PRODUCTS

2.1 CARPET

A. Available Manufacturers:
   1. Supplier: Tretford – Tretford Roll (620 Charcoal and 534 Anthracite) Prestige Mills Inc. 34-01 38th Avenue, Long Island City, New York 11101 Tel.: 718. 683. 5051 Tel: 800.223. 1224 email: www.prestigemills.com; Or an Approved Equal
   2. Shaw Contract
      a. Brush Works Collection
      b. Vertical Layers Collection
      c. Places Collection
      d. Or an Approved Equal
   3. Interface
      a. Near and Far Collection
      b. Equal Measure Collection
      c. Or an Approved Equal
   4. Mohawk Group
      a. Telling Spaces Collection
      b. Preety Concrete Collection
      c. Or an Approved Equal
   5. Tandus
      a. Crosswork Collection
      b. Landform Colours Collection
      c. Kharaplex 44038 (Stalagmite 01829)
      d. Or an Approved Equal

2.2 CARPET MATERIALS

A. Carpet Roll: Bonded with 100% natural latex to a hessian backing.

B. Pile Yarn: Provide yarn spun in the manner recommended by the yarn manufacturer and the carpet tile manufacturer, in number of plies and denier indicated or required, to achieve the pile yarn weight, texture and pattern indicated.

Dye:	Type Face Yarn	100% "Commercial on" Soil-hiding Nylon
	Yarn Size	3.55/2 Heat-Set
	Ply Twist	6.0 TPI as tested under ASTM D 1222-82
	Construction	Dense Cut Pile
	Special Treatments	"Scotch Guard"
	Pile Height	.375 Inch
	Stitches Per Inch	12
	Tufts Per Sq. In.	120
	Tufts Per Sq. Yd.	155,520
	Gauge	1/10 (270 Pitch)
	Static Resistance	Below 3.5 Kilovolts as tested under SSTCC-
	Density Factor	4,800
	Weight Density Factor	240,000
	Pile Weight	40 oz. /Sq. Yd. (1695 Gms./Sq.M.)
	Width	12' (3.66 M)
	Primary Backing	Polyprolylene
	Secondary backing	Jute or Sythetic (Mill Option Only)
	Total Weight (Jute)	93.3 oz./Sq. Yd. (3,164 Grms./Sq.M.)
	Total Width (Synthetic)	91.0 oz./Sq. Yd. (3,086 Grms./Sq.M.)
	Pattern	As directed by Architect or RE/PM
	Color	As directed by Architect or RE/PM

2.3 WOVEN VINYL FLOOR

A. Supplier: BOLON by VIIIR. The Bolon Room, 11-22 44th Road, Long Island City, NY 11101. Telephone: 718.392.0161; Voicemail Access: 718.361.1046; Second Line/Fax: 718.392.0375; email: info@viiir.com ; website: www.viiir.com; Or an Approved Equal.

B. Bolon BKB sheet goods
1. Roll thickness: 2.8 mm
2. Roll weight: 0.62 lbs/sq ft
3. Roll Colors: TBD
4. Tile size: 19 11/16" x 19 11/16"
5. Tile thickness: 3.4 mm
6. Tile weight: 0.86 lbs/sq ft

C. Performance Physical properties of the indoor resilient flooring shall conform to the following minimums:
1. Safety
   a. Critical radiant flux ASTM E648 Class 1
   b. Smoke density ASTM E662 Pass
   c. Surface Flammability ASTM D2859 Pass
2. Performance

a. Sound absorption ISO 140-8 Eight, Graphic, Limited, Spektra Create, Missoni: 11dB
b. Antistatic behavior EN 1815 < 2 kV
c. Thermal resistance ISO 8302 Eight, Graphic, Spektra, Create, Missoni: .01 m2 /KW;
d. Dimensional stability EN 434

3. Durability
   a. Wear group class EN 685
   b. Fraying behavior EN 1814 No fraying
   c. Chair with castors EN 985
   d. Color fastness to light ISO 105-B02 >6
   e. Residual indentation EN 433 < 0.2 mm
   f. Hexapod Drum ASTM D5252 Appearance: 5; Color: 5
   g. Static Load Limit ASTM F970 500 psi

2.4 CARPET CUSHION

A. Available Products: 40 oz. padding as selected by DCAS.

2.5 CARPET TILE

A. Manufacturing Specifications- Interface Flooring Systems, Inc. or an Approved Equal.

2.6 INSTALLATION ACCESSORIES

A. Concrete-Slab Primer: Nonstaining, VOC compliant type as recommended by the following:

B. Carpet manufacturer.
   1. Carpet cushion manufacturer.
   2. “Floorstone,” or an Approved Equal.

C. Trowelable Underlayments and Patching Compounds: VOC compliant as recommended by the following:
   1. Carpet manufacturer.
   2. Carpet cushion manufacturer.

D. Adhesives: Water-resistant, mildew-resistant, VOC compliant, nonstaining type to suit products and subfloor conditions indicated and to comply with flammability requirements for installed carpet as recommended by the following:
   1. Carpet manufacturer.
   2. Carpet cushion manufacturer.

E. Adhesive VOC Limits: Provide adhesives that comply with the following limits for VOC content when tested according to ASTM D 5116.

F. Tackless Carpet Stripping: Water-resistant plywood in strips as required to match cushion thickness and in compliance with CRI 104, 11.3.

G. Seaming Cement: Hot-melt adhesive tape or similar product recommended by carpet manufacturer

for taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

H. Leveling Compound: Latex/Portland cement flash patching and leveling compound equal to No. DSP-504 made by Specialty Construction Brands Inc., or No. 226 with 3701 admixture made by Laticrete or equal made by Mapei, or an Approved Equal.

I. Miscellaneous Materials: Provide the types of seaming, adhesives and tape, thread, and other accessory items recommended by the carpet manufacturer and Installer for the conditions of installation and use.

PART 3- EXECUTION

3.1 EXAMINATION

A. Examine subfloors and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting performance of carpet. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Verify that subfloors and conditions are satisfactory for carpet installation and comply with requirements specified in this Section. The Contractor shall notify DCAS in writing of any conditions which will prevent him from producing satisfactory finish work.

3.2 PREPARATION

A. General: Comply with carpet manufacturer’s installation recommendations to prepare substrates indicated to receive carpet installation.

B. Level subfloor within 1/4 inch in 10 feet (6 mm in 3 m), noncumulative, in all directions. Sand or grind protrusions, bumps, and ridges. Patch and repair cracks and rough areas. Fill depressions.
   1. Use leveling and patching compounds to fill minor cracks, holes, and depressions in subfloor as required.

C. Remove subfloor coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone.

D. Clear away debris and scrape up cementitious deposits from surfaces to receive carpeting.

E. Vacuum clean subfloors to be covered with carpet immediately before installation. Following cleaning, examine subfloors for moisture, alkaline salts, carbonation, or dust.

F. Concrete-Subfloor Preparation: Apply concrete-slab primer, according to manufacturer’s directions. Ensure no “dusting” through installed carpet; apply sealer where required to prevent dusting.

G. Wood-Subfloor Preparation: Apply wood-floor sealer, according to manufacturer’s directions.

H. Resilient-Flooring Substrate Preparation: Replace missing pieces of existing resilient flooring or patch to level. Cut out peaked seams and fill with latex underlayment as recommended by

manufacturer. Repair depressions with filler material.

I. The Contractor shall remove all furniture, equipment and moveable obstructions to allow installation of wall to wall carpeting and place back in original location and position upon completion of work.

J. Sequence carpeting with other work so as to minimize possibility of damage and soiling of carpet during remainder of construction period.

3.3 INSTALLATION

A. General

1. Comply with manufacturer's instructions and recommendations. Place seams in the directions as accepted on shop drawings. Maintain direction of pattern and texture, including lay of pile. So not seam weft to warp. At doorways, center seams under door in closed position. Do not bridge building expansion joints with continuous carpet.
2. Unless otherwise directed, install pattern parallel to walls and borders.
3. Install carpet cushion seams at 90-degree angle with carpet seams.
4. Where demountable partitions or other items are indicated for installation on top of finished carpet floor, install carpet before installation of these items.
5. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer. Coordinate installation with installation of wall base to establish sequences and details of overlapping work.
6. Extend carpet into toe spaces, door reveals, closets, and alcoves of rooms indicated to be carpeted, unless another floor finish is indicated for such spaces. Extend carpet under open-bottomed obstructions and removable flanges. Extend carpet under all movable furniture and equipment, unless otherwise indicated.
7. Provide cut-outs for removable access devices in the substrate. Bind edges as neatly as possible and secure both sides of cuts to the substrate. Use double-faced tape on carpet cut-outs which must be lifted from the substrate to gain access to the devices. Cut only three (3) sides wherever it is feasible to provide a carpet flat in lieu of a fully removable cut-out.
8. Carpet moldings or metal binder bars shall be installed at all areas where floor covering material changes, or a carpet edge does not about a vertical surface. Open doorways to be finished with anodized tap down metal.
9. Carpets shall be installed wall to wall using continuous lengths and as broad widths as possible. Cut edges shall be true and appropriately treated to form nonraveling joints where exposed. Carpet shall be installed in accordance with Carpet Manufacturer's recommendations for seaming techniques and seaming cement where required.
10. Seams, if absolutely necessary, shall be as few as possible and as nearly invisible as possible. Seaming diagram showing location of all seams shall be submitted for approval before installation is started.
11. Doors must be undercut where required to prevent abrasion of newly installed carpet.
12. The Contractor shall neatly cut new wall to wall carpeting for any electrical and/ or telephone floor system.
13. Installed carpeting shall be properly stretched and upon completion shall show no signs of bilges, spots, dirt, soiling, tears, frays, or pulls.
14. All expansion joints, cracks, gaps and indents shall be filled with a quality floor patching compound on latex base filler. All high spots or ridges shall be leveled by sanding. All low or shallow places shall be filled or built up with latex base underlayment.
15. All edges cut for seaming must be treated with a seam sealer. Any excess sealer getting to the

face of the pile should be removed with the solvent recommended for that purpose.

16. All carpet adhered to the floor with adhesive should have 100 percent contact with the adhesive.

B. Direct Glue-Down Installation

1. Direct Glue-Down Installation: Comply with CRI 104, Section 8: "Direct Glue-Down."
2. Unroll carpet face up and cut the lengths required, making sure that pile-lay runs in the same direction. Check starting wall for squareness, allow for off-square wall. Strike chalk line the entire length of area where seam falls.
3. Place two (2) lengths in proper position for installing, trim selvedge. Line up seam edge with chalk line. Make sure that carpet lays perfectly flat and tension free.
4. Fold or roll both widths back three (3) feet from seam area the entire length of the carpet.
5. Installers shall start spreading adhesive from approximate center towards each end using 1/16" V-notched trowel on concrete subfloors.
6. When sufficient floor area has been covered with adhesive, the first width can be dropped or rolled into place. Apply coating of edge sealer to seam edge of first width.
7. The remaining portion of the first width can now be folded or rolled from the wall. The adhesive is applied to the floor and the carpet dropped or rolled into place. Be sure to have enough men spreading the adhesive so that after the floor area is covered with the adhesive, the carpet must be in place within the twenty (20) minute open time.
8. Roll or fold back dry portion of second width towards seam, spread the adhesive and place carpet to three (3) feet from where next seam will fall.
9. Brush or roll out looseness and air bubbles as carpet is put in place. Repeat above procedure on continuing widths. For trimming carpet at wall, use razor blade knife or suitable wall trimmer.
10. Contact adhesive (about six (6) inches wide) must be used along carpet edges where they butt to a wall and along all cross-seams to minimize the possibility of later shrinkage from over-wetting. Strike a chalk line along carpet width six (6) inches from edge and apply contact adhesive to both floor and carpet back according to instructions.

C. Carpet with Attached-Cushion Installation: Comply with CRI 104, Section 10: "Attached Cushion."

D. Stretch-in Installation: Comply with CRI 104, Section 11: "Stretch-in Utilizing Tackless Strip."

E. Stair Installation: Comply with CRI 104, Section 12: "Carpet on Stairs."

F. Carpet Molding Installation

a. The edges of carpet ending at doorways or connecting with resilient or hard surface flooring should be anchored with metal binders ("Z" bars).
b. Provide metal or vinyl edge molding as binder bar, stair nosing, reducer strips, etc. as needed with the Architect's approval.

3.4 CLEANING

A. Perform the following operations immediately after completing installation.

a. Remove visible adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
b. Remove protruding yarns from carpet surface.
c. Vacuum carpet using commercial machine with face-beater element.

d. After completion of the installation, all dirt, carpet scraps, packaging and rubbish shall be removed.
e. Soiled spots will be removed with Manufacturer's recommended spot remover.
f. Excessive adhesive on carpet may be removed with sharp scissors.
g. Any damaged carpet caused during clean up will be replaced by the Contractor at no additional cost.

3.5 PROTECTION

A. General: Comply with CRI 104, Section 15: "Protection of Indoor Installation."

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure carpet is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 096800

SECTION 096813
TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Contract Documents apply to this Section.

1.2 SUMMARY

A. Section includes modular, fusion-bonded and tufted carpet tile.

B. Related Requirements:
1. Division 09 Section "Tiling" for resilient wall base and accessories installed with carpet tile.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at various DCAS Sites.
1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
   a) Review delivery, storage, and handling procedures.
   b) Review ambient conditions and ventilation procedures.
   c) Review subfloor preparation procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include installation recommendations for each type of substrate.

B. LEED Submittals:
1. Product Data for Credit EQ 4.3:
   a) For carpet tile, documentation indicating compliance with testing and product requirements of CRI's "Green Label Plus" program.
   b) For installation adhesive, documentation including printed statement of VOC content.
2. Laboratory Test Reports for Credit EQ 4: For carpet and installation adhesives, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental

C. Shop Drawings: Show the following:
1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.

5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

D. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-long Samples.

E. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

F. Sustainability: Provide the Statement of the Achievement Level the carpet has attained for Bronze, 28 to 36, Silver, 37 to 51 and Gold, 52 to 70 points, based on specific Sustainable Attribute Performance for all product stages according to ANSI/NSF 140.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Carpet Tile: Full-size units equal to **5** percent of amount installed for each type indicated, but not less than 10 sq. yd.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Build mockups at locations and in sizes shown on Drawings.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

1.10 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
   1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
   2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
   3. Warranty Period: Ten 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Products: Subject to compliance with requirements, provide one of the following:
   1. Interface.
   2. Mohawk Group.
   3. Shaw Carpet.
   4. Or Approved Equal

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Interface.
   2. Mohawk Group.
   3. Shaw Carpet.
   4. Or Approved Equal

C. Color: As selected by Architect from manufacturer's full range.

D. Pattern: As selected by Architect from manufacturer's full range.

E. Fiber Content: 80 percent wool; 20 percent nylon.

F. Fiber Type: natural and synthetic.

G. Pile Characteristic: Cut-and-loop pile.

H. Yarn Twist: 3.5 to 6.0 TPI.

I. Yarn Count: 60.

J. Density: 7,297 oz./cu. yd.

K. Pile Thickness: 0.74 inches for finished carpet tile according to ASTM D 6859.

L. Stitches: 7.66 per inch.

M. Gage: 1/8 per inch.

N. Surface Pile Weight: 35 oz./sq. yd.

O. Total Weight: 30 to 40 oz./sq. yd. for finished carpet tile.

P. Primary Backing/Backcoating: Manufacturer's standard composite materials.

Q. Secondary Backing: Manufacturer's standard material.

R. Backing System: GlasBac and CushionBac.

S. Size: 18 by 18 inches, 24 by 24 inches, 18 by 36 inches and 36 by 36 inches.

T. Applied Soil-Resistance Treatment: Manufacturer's standard material.

U. Antimicrobial Treatment: Manufacturer's standard material.

V. Performance Characteristics: As follows:
1. Appearance Retention Rating: Heavy traffic, 3.0 minimum according to ASTM D 7330.
2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.
3. Dry Breaking Strength: Not less than 100 lbf according to ASTM D 2646.
4. Tuft Bind: Not less than 8 lbf according to ASTM D 1335.
5. Delamination: Not less than 4 lbf/in. according to ASTM D 3936.
6. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
7. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
8. Resistance to Insects: Comply with AATCC 24.
9. Noise Reduction Coefficient (NRC): .65 according to ASTM C 423.

10. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
11. Colorfastness to Light: Not less than 4 after **60** AFU (AATCC fading units) according to AATCC 16, Option E.
12. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.
13. Electrostatic Propensity: Less than **3.5** kV according to AATCC 134.
14. Emissions: Provide carpet tile that complies with testing and product requirements of CRI's "Green Label Plus" program.
15. Emissions: Provide carpet tile that complies with the product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
   1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
   1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
   2. Subfloor finishes comply with requirements specified in Division 03 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
   3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. For wood subfloors, verify the following:

1. Underlayment over subfloor complies with requirements specified in Division 06 Section "Rough Carpentry."
2. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

D. For metal subfloors, verify the following:
1. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

E. For painted subfloors, verify the following:
1. Perform bond test recommended in writing by adhesive manufacturer.

F. For raised access flooring systems, verify the following:
1. Access floor complies with installation requirements specified in Division 09 Section "Access Flooring."
2. Access floor substrate is compatible with carpet tile and adhesive if any.
3. Underlayment surface is flat, smooth, evenly planed, tightly jointed, and free of irregularities, gaps greater than 1/8 inch, protrusions more than 1/32 inch, and substances that may interfere with adhesive bond or show through surface.

G. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer or Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders.

H. Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:
1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

SECTION 097500
STONE FACING

PART 1- GENERAL

1.1 SUMMARY

A. Drawings and Contract Documents apply to this Section.

B. This Section includes the following interior applications of dimension stone:
1. Wall paneling.
2. Wainscot paneling.
3. Column facing.
4. Base.
5. Trim.

C. Related Requirements:
1. Division 03 Section "Cast-in-Place Concrete" for installing concrete inserts for anchoring stone paneling.
2. Division 04 Section "Unit Masonry" for installing masonry inserts for anchoring stone paneling.
3. Division 07 Section "Joint Sealants" for sealing joints in stone paneling system with elastomeric sealants.
4. Division 09 Section "Stone Tiling" for stone wall tile.

1.2 ACTION SUBMITTALS

A. Product Data: For each variety of stone, stone accessory, and manufactured product.

B. Shop Drawings: Show fabrication and installation details for stone paneling system, including dimensions and profiles of stone units.
1. Include plans, elevations, sections, details, and attachments to other work.
2. Show locations and details of joints both within stone paneling system and between stone paneling system and other finish materials.
3. Show locations and details of anchors, including locations of supporting construction.
4. Show direction of veining, grain, or other directional pattern.
5. Include large-scale shaded drawings of decorative surfaces and inscriptions.

C. Samples for Initial Selection: For joint materials involving color selection.

D. Samples for Verification:
1. For each stone type indicated, in sets of Samples not less than 12 inches (300 mm) square. Include three or more Samples in each set and show the full range of variations in appearance characteristics in completed Work. Samples will establish the standard by which stone will be judged.
2. For each color of grout pointing mortar and sealant required.
3. For carving and inscriptions.

E. Delegated-Design Submittal: For stone paneling assembly.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and fabricator.

B. Sealant Compatibility Test Report: From sealant manufacturer, complying with requirements in Division 07 Section "Joint Sealants" and indicating that sealants will not stain or damage stone.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For stone paneling to include in maintenance manuals. Include product data for stone-care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate interior stone facing similar in scope, materials, and extent to that indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Installer Qualifications: Fabricator of interior stone facing.

C. Installer Qualifications: An installer who employs experienced stone setters who are skilled in installing interior stone facing similar in material, design, and extent to that indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
1. Installer's responsibilities include fabricating and installing interior stone facing, including anchoring system, and providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

D. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
1. Build mockup of typical wall area as shown on Drawings.
2. Build mockups for the following kinds of interior stone facing:
   a. Typical interior stone wall paneling, about 72 inches (1800 mm) long by 96 inches (2400 mm) high.
   b. Typical interior stone wainscot paneling with wainscot cap, about 72 inches (1800 mm) long by full wainscot height.
   c. Stone base, about 72 inches (1800 mm) long.
   d. Typical column facing, one complete column.
   e. Grouting or pointing of joints.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.
   1. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.
   2. Store stone on wood A-frames or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to stone. Ventilate under covers to prevent condensation.

B. Mark stone units, on surface that will be concealed after installation, with designations used on Shop Drawings to identify individual stone units. Orient markings on vertical panels so that they are right side up when units are installed.

C. Deliver sealants to Project site in original unopened containers labeled with manufacturer's name, product name and designation, color, expiration period, pot life, curing time, and mixing instructions for multicomponent materials.

D. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

1.7 PROJECT CONDITIONS

A. Maintain air and material temperatures to comply with requirements of installation material manufacturers, but not less than 50 deg F (10 deg C) during installation and for seven days after completion.

B. Field Measurements: Verify dimensions of construction to receive stone paneling by field measurements before fabrication and indicate measurements on Shop Drawings.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabrication without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

A. Coordinate installation of inserts that are to be embedded in concrete or masonry and similar items to be used by stone paneling Installer for anchoring and supporting stone paneling. Furnish setting drawings, templates, and directions for installing such items and deliver to Project site in time for installation.

B. Time delivery and installation of stone paneling to avoid extended on-site storage and to coordinate with work adjacent to stone paneling.

PART 2- PRODUCTS

2.1 SOURCE LIMITATIONS

A. Source Limitations for Stone: Obtain each variety of stone, regardless of finish, from a single quarry,

whether specified in this Section or in another Section, with resources to provide materials of consistent quality in appearance and physical properties.

1. For stone types that include same list of varieties and sources, provide same variety from same source for each.
2. Make quarried blocks available for Architect to examine for appearance characteristics.
3. Make stone slabs available for Architect to examine for appearance characteristics.
   a. Architect will select aesthetically acceptable slabs and will indicate aesthetically unacceptable portions of slabs.
   b. Segregate slabs selected for use on Project and mark backs indicating approval.
   c. Mark and photograph aesthetically unacceptable portions of slabs as directed by Architect.

B. Source Limitations for Other Materials: Obtain each type of grout, stone accessory, sealant, and other material through one source from a single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General: Design stone anchors and anchoring systems according to ASTM C 1242.

B. Seismic Performance: Stone paneling system shall withstand the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures.
   1. Component Importance Factor: 1.5 & 1.0.

2.3 STONE

A. Varieties and Sources: Subject to compliance with requirements, provide stone of varieties and from sources complying with Division 04.

2.4 GRANITE

A. Material Standard: Comply with ASTM C 615

B. Description: Uniform, medium-grained, as per specification.

C. Available Varieties and Sources: Subject to compliance with requirements, stone varieties that may be incorporated into the Work include, but are not limited to, the following:

D. Variety and Source: Subject to compliance with requirements, provide the following:
   1. As per approved producers, distributors, or importers.

E. Cut: Vein or Fleuri cut as indicated.
   1. Orientation of veining as indicated.
   2. Cut stone from one block or contiguous, matched blocks in which natural markings occur.

F. Finish: Polished, Honed, or Thermal as indicated, or Match Architect's sample for color, finish, and other stone characteristics relating to aesthetic effects.

2.5 MARBLE

A. Material Standard: Comply with ASTM C 503.

B. Description: Uniform, fine- to medium-grained, white stone with only slight veining.

C. Available Varieties and Sources: Subject to compliance with requirements, stone varieties that may be incorporated into the Work include, but are not limited to, the following:

D. Variety and Source: Subject to compliance with requirements, provide the following:
1. As per approved producers, distributors or importers.

E. Cut: Vein or Fleuri cut as indicated.
1. Orientation of veining as indicated.
2. Cut stone from one block or contiguous, matched blocks in which natural markings occur.

F. Finish: Polished, Honed, or Thermal as indicated, or Match Architect's sample for color, finish, and other stone characteristics relating to aesthetic effects.

2.6 SETTING MATERIALS

A. Molding Plaster: ASTM C 59/C 59M.

B. Portland Cement: ASTM C 150/C 150M, Type I or Type II.
1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.

C. Hydrated Lime: ASTM C 207, Type S.

D. Aggregate: ASTM C 144.

E. Water: Potable.

2.7 ADHESIVES

A. Adhesives, General: Use only adhesives formulated for stone and ceramic tile and recommended by their manufacturer for the application indicated.

B. Organic Adhesive: ANSI A136.1, Type I., with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24)., that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
1. Available Manufacturers: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Boiardi Products Corporation.
   b. Bostik Findley Inc.
   c. C-Cure.

d. Custom Building Products.
e. DAP Inc.
f. Laticrete International, Inc.
g. MAPEI Corp.
h. TEC Incorporated; H. B. Fuller Company.
i. Or an Approved Equal.

C. Water-Cleanable Epoxy Adhesive: ANSI A118.3., with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24)., that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
1. Available Manufacturers: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Bonsal, W. R. Company.
   b. Bonstone Materials Corporation.
   c. C-Cure.
   d. Custom Building Products.
   e. Laticrete International, Inc.
   f. MAPEI Corp.
   g. Summitville Tiles, Inc.
   h. Or an Approved Equal.

D. Stone Adhesive: 2-part, epoxy-resin or polyester-resin stone adhesive with an initial set time of not more than 2 hours at 70 deg F (21 deg C)., and with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPAMethod 24)., that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
1. Color: Match stone.
2. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
3. Products: Subject to compliance with requirements, provide one of the following:
   a. Epoxy Adhesive: Akemi North America; Akepox.
   b. Epoxy Adhesive: Axson North America, Inc., Wood & Stone Company; Akabond Epoxy.
   c. Epoxy Adhesive: Bonstone Materials Corporation; Touchstone Last Patch.
   d. Epoxy Adhesive: Bonstone Materials Corporation; Touchstone Ratio Pac Clear Gel Epoxy.
   e. Epoxy Adhesive: or an Approved Equal.
   f. Polyester Adhesive: Akemi North America; Platinum Clear Polyester Adhesive.
   g. Polyester Adhesive: Axson North America, Inc., Wood & Stone Company; Wood & Stone Polyester.
   h. Polyester Adhesive: Bonstone Materials Corporation; Gripstone L-200KG.
   i. Polyester Adhesive: Or an Approved Equal.

2.8 GROUT

A. Grout Colors: As selected by Architect from manufacturer's full range.

B. Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate as required to produce required color.

C. Standard Sanded Cement Grout: ANSI A118.6.

D. Standard Unsanded Cement Grout: ANSI A118.6.

E. Polymer-Modified Tile Grout: ANSI A118.7.
   1. Available Manufacturers: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Boiardi Products Corporation.
      b. Bonsal, W. R. Company.
      c. Bostik Findley Inc.
      d. C-Cure.
      e. Custom Building Products.
      f. DAP Inc.
      g. Laticrete International, Inc.
      h. MAPEI Corp.
      i. Summitville Tiles, Inc
      j. TEC Incorporated; H. B. Fuller Company.
      k. Or an Approved Equal.
   2. Polymer Type: Ethylene vinyl acetate, in dry, redispersible form, prepackaged with other dry ingredients.
   3. Polymer Type: Acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.
   4. Polymer Type: Either ethylene vinyl acetate, in dry, redispersible form, prepackaged with other dry ingredients, or acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.
   5. Grout Type: Unsanded.

F. Water-Cleanable Epoxy Grout: ANSI A118.3, chemical-resistant, water-cleanable, tile- setting and –grouting epoxy.
   1. Available Manufacturers: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Boiardi Products Corporation.
      b. Bonsal, W. R. Company.
      c. Bostik Findley Inc.
      d. C-Cure.
      e. Custom Building Products.
      f. Laticrete International, Inc.
      g. MAPEI Corp.

h. Summitville Tiles, Inc.
i. TEC Incorporated; H. B. Fuller Company.
j. Or an Approved Equal.

2.9 POINTING MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type I or II. Provide natural color or white cement as required to produce mortar color indicated.
1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of 8ortland cement complying with ASTM C 150, Type I or III, and hydrated lime complying with ASTM C 207, Type S.

D. Colored Portland Cement-Lime Mix: Packaged blend of 8ortland cement complying with ASTM C 150, Type I or Type III; hydrated lime complying with ASTM C 207, Type S; and mortar pigments. Use a mix of formulation required to produce color indicated or, if not indicated, as selected from manufacturer's standard formulations. Pigments shall not exceed 10 percent of Portland cement by weight. Portland Cement: ASTM C 150/C 150M, Type I or Type II. Provide natural color or white cement as required to produce mortar color indicated.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
a. Essroc, Italcementi Group; Capitol PCL Blend or Saylor's Plus.
b. Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
c. Lafarge North America Inc.; Eaglebond.
d. Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.
e. Or an Approved Equal.

E. Aggregate: ASTM C 144, except with 100 percent passing No. 16 (1.18-mm) sieve.
1. White Aggregates: Natural white sand or ground white stone.
2. Colored Aggregates: Natural-colored sand or ground marble, granite, or other durable stone; of color necessary to produce required mortar color.

F. Mortar Pigments: Natural and synthetic iron oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in mortar and containing no carbon black.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
a. Bayer, Industrial Chemicals Division; Bayferrox Iron Oxide Pigments.
b. Davis Colors; True Tone Mortar Colors.
c. Solomon Colors; SGS Mortar Colors.
d. Or an Approved Equal.

G. Water: Potable.

2.10 SEALANTS

A. Joint Sealants: Manufacturer's standard sealants of characteristics indicated below that comply with applicable requirements in Division 07 Section "Joint Sealants" and will not stain the stone they are applied to.
   1. Single component, mildew-resistant, neutral –curing silicone sealant.
   2. Single component, nonsag urethane sealant.
   3. Latex Sealant LS-<#>.
   4. VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   5. Colors: Provide colors of exposed sealants to match colors of grout in stone adjoining sealed joints, unless otherwise indicated.

B. Sealant for Filling Kerfs: Same sealant used for joints in dimension stone Manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated below that comply with applicable requirements in Division 07 Section "Joint Sealants" and that do not stain stone.
   1. Single component, nonsag, urethane sealant; Class 25, Use T (traffic), and Use M (masonry).
   2. Single-component, nonsag, neutral-curing, medium to high modulus, silicone sealant; Class 25, Use NT (nontraffic), and Use M (masonry).
   3. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   4. Products: Subject to compliance with requirements, provide one of the following:
      a. Sika Corporation, Inc.; Sikaflex – 1a.
      b. Sonneborn, Division of ChemRex; NP 1.
      c. Sonneborn, Division of ChemRex; Ultra.
      d. Tremco Incorporated, Sealant/Waterproofing Division; Spectrem 2.
      e. Tremco Incorporated, Sealant/Waterproofing Division; Vulkem 116.
      f. Or an Approved Equal.

2.11 STONE ANCHORS AND ATTACHMENTS

A. Fabricate anchors from stainless steel, ASTM A 240/A 240M, Type 304.
   1. Fasteners for Stainless-Steel Anchors: Annealed stainless-steel bolts, nuts, and washers; ASTM F 593 (ASTM F 738M) for bolts and ASTM F 594 (ASTM F 836M) for nuts, Alloy Group 1 (A1).

B. Fabricate dowels from stainless steel, ASTM A 276, Type 304.

C. Fabricate anchors from extruded aluminum, ASTM B 221 (ASTM B 221M), alloy and temper as required to support loads imposed without exceeding allowable design stresses, but not less than strength and durability properties of Alloy 6063-T6.
   1. Fasteners for Extruded-Aluminum Anchors: Annealed stainless-steel bolts, nuts, and washers; ASTM F 593 (ASTM F 738M) for bolts and ASTM F 594 (ASTM F 836M) for nuts, Alloy Group 1 (A1).

D. Anchor Support Grids: Roll-formed steel channels, of size and shape required for application indicated, formed from galvanized steel sheet not less than 0.108 inch (2.8 mm) thick and complying with ASTM A 653/A 653M, G90 (Z275).

1. Fittings and Fasteners: System manufacturer's standard components of design, size, and material required to securely attach grids to building structure and stone anchors to grids. Fabricate components in contact with stone from same material specified for anchors.

E. Wire Tiebacks: No. 9 AWG copper or copper-alloy or 0.120-inch- (3.0-mm-) diameter, stainless-steel wire.

F. Dovetail Slots: Furnish dovetail slots with filler strips of slot size required to receive anchors provided, fabricated from 0.0336-inch- (0.85-mm-) thick, galvanized steel sheet complying with ASTM A 53/A 653M, G90 (Z275). Fabricate anchors from stainless steel, ASTM A 240/A 240M or ASTM A 666, Type 304.

G. Direct-Mount Anchoring Systems: Stainless-steel or aluminum stone anchors designed to be applied directly to wall surfaces or to metal grids. System is secured to wall framing, furring, or sheet-metal reinforcing strips built into wall with stainless-steel self-drilling screws. Anchors fit into kerfs or holes in edges of interior stone facing panels and do not need setting spots.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
   a. Halfen Anchoring Systems; Meadow-Burke.
   b. Heckmann Building Products Inc.
   c. Hohmann & Barnard, Inc.
   d. Or an Approved Equal.

2.12 STONE ACCESSORIES

A. Temporary Setting Shims: Rigid plastic shims, nonstaining to stone, sized to suit joint thickness.

B. Setting Shims for Direct-Mount Anchoring Systems: Strips of resilient plastic or neoprene, nonstaining to stone, of thickness needed to prevent point loading of stone on anchors and of depths to suit anchors without intruding into required depths of pointing materials.

C. Cleaner: Stone cleaner specifically formulated for stone types, finishes, and applications indicated, as recommended by stone producer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.

D. Stone Sealer: Colorless, stain-resistant sealer that does not affect color or physical properties of stone surfaces, as recommended by stone producer for application indicated.
1. Available Manufacturers: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Bostik Findley Inc.
   b. Custom Building Products.
   c. Hillyard, Inc.
   d. HMK Stone Care System.
   e. Miracle Sealants Company.
   f. Stonecare International.

g. Summitville Tiles, Inc.
h. Or an Approved Equal.

2.13 STONE FABRICATION, GENERAL

A. Select stone for intended use to prevent fabricated units from containing cracks, seams, and starts that could impair structural integrity or function.
   1. Repairs that are characteristic of the varieties specified are acceptable provided they do not impair structural integrity or function and are not aesthetically unpleasing, as judged by Architect.

B. Fabricate interior stone facing in sizes and shapes required to comply with requirements indicated, including details on Drawings and Shop Drawings.
   1. For granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite."
   2. For marble, comply with recommendations in MIA's "Dimension Stone–Design Manual."

C. Cut stone to produce pieces of thickness, size, and shape indicated and to comply with fabrication and construction tolerances recommended by applicable stone association.
   1. Where items are installed with adhesive or where edges of stone is visible in the finished work, make items uniform in thickness and of identical thickness for each type of item; gage back of stone if necessary.
   2. Clean sawed backs of stones to remove rust stains and iron particles.
   3. Dress joints straight and at right angle to face, unless otherwise indicated.
   4. Cut and drill sinkages and holes in stone for anchors, supports, and lifting devices as indicated or needed to set stone securely in place; shape beds to fit supports.
   5. Provide openings, reveals, and similar features as needed to accommodate adjacent work.

D. Fabricate molded work to produce stone shapes with a uniform profile throughout entire unit length and with precisely formed arris slightly eased to prevent snipping, and matched at joints between units.
   1. Produce moldings with machines having abrasive shaping wheels made to reverse contour of molding shape; do not sculpt moldings.
   2. Miter moldings at corners, unless otherwise indicated, with edges of miters slightly eased at outside corners.

E. Finish exposed faces and edges of stone to comply with requirements indicated for finish of each type of stone required and to match approved Samples and mockups.

F. Carefully inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.
   1. Grade and mark stone for overall uniform appearance when assembled in place. Natural variations in appearance are acceptable if installed stone units match range of colors and other appearance characteristics represented in approved Samples and mockups.

2.14 STONE PANELING AND COLUMN FACING

A. Arrange panels in shop or other suitable space in proposed orientation and sequence for examination by Architect. Mark units with temporary sequence numbers to indicate position in proposed layout.
   1. Lay out one elevation at a time if approved by Architect.
   2. Notify Architect seven days in advance of date and time when layout will be available for

viewing.
3. Provide lighting of similar type and level as that of final installation for viewing layout, unless otherwise approved by Architect.
4. Rearrange panels as directed by Architect until layout is approved.
5. Do not trim nonmodular-size units to less than modular size until after Architect's approval of layout, unless otherwise approved by Architect.
6. Mark backs of units and Shop Drawings with sequence numbers based on approved layout. Mark backs of units to indicate orientation of units in completed Work.

B. Nominal Thickness: up to 1-1/4 inches (32 mm) , unless otherwise indicated.

C. Maintain minimum clearances of 3/4 inch (20 mm) 1 inch (25 mm) between backs of panels and structural members, fireproofing if any, backup walls, and other work behind stone. Do not back check stone less than 1 inch (25 mm) thick.

D. Joints: as indicated or as per design.

Quirk-miter corners, unless otherwise indicated. Install anchorage in top and bottom bed joints of corner units.

E. Carve and cut inscriptions and decorative surfaces according to Shop Drawings. Use skilled stone carvers experienced in the successful performance of work similar to that indicated.

F. Abrasively etch inscriptions and decorative surfaces according to Shop Drawings.

G. Etch laser inscriptions and decorative surfaces according to Shop Drawings.

H. Pattern Arrangement: Fabricate and arrange panels with veining and other natural markings to comply as designed.

2.15 STONE BASE AND TRIM

A. Base:
1. Nominal Thickness: up to 1-1/4 inches (32 mm), unless otherwise indicated.
2. Top-Edge Detail: Straight, slightly eased at corner As indicated.
3. Ends: Butt ends into casings Butt ends into opening frames Return ends to depth of adjacent finish with edge detail same as top edge, unless otherwise indicated.
4. Joints: as indicated, sealant-filled joints Bonded joints, 1/32 inch (0.8 mm) or less in width.
5. Locate joints at midpoints between adjacent paneling joints, unless otherwise indicated.

B. Flat Trim:
1. Nominal Thickness: up to 1-1/4 inches (32 mm), unless otherwise indicated.
2. Edge Detail: As indicated.
3. Joints: as indicated, sealant-filled joints Bonded joints, 1/32 inch (0.8 mm) or less in width.

C. Molded Trim:
1. Profile: Match profiles indicated on Drawings or to match existing as indicated.
2. Joints: as indicated, sealant-filled joints Bonded joints, 1/32 inch (0.8 mm) or less in width.

2.16 MIXES

A. Spotting Plaster: Stiff mix of molding plaster and water.

B. Mortar: Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortar of uniform quality and with optimum performance characteristics.
   1. Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated. Do not use calcium chloride.
   2. Combine and thoroughly mix cementitious materials, water, and aggregates in a mechanical batch mixer, unless otherwise indicated. Discard mortar when it has reached initial set.

C. Setting Mortar: Comply with ASTM C 270, Proportion Specification.
   1. Mix Proportions: 1 part Portland cement and 2-1/2 to 4 parts lime with aggregate ratio of 2-1/4 to 3 times volume of cement and lime.

D. Pointing Mortar: Comply with ASTM C 270, Proportion Specification, for types of mortar indicated. Provide pointing mortar mixed to match Architect's sample and complying with the following:
   1. Pigmented Pointing Mortar: Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1:10, by weight.
   2. Packaged Portland Cement-Lime Mix Mortar: Use portland cement-lime mix of selected color.
   3. Colored-Aggregate Pointing Mortar: Produce color required by combining colored aggregates with portland cement of selected color.
   4. Mix Proportions: 1 part Portland cement and 2-1/2 to 4 parts lime with aggregate ratio of 2-1/4 to 3 times volume of cement and lime.

E. Grout: Comply with mixing requirements of referenced ANSI standards and with manufacturer's written instructions.

PART 3- EXECUTION

3.1 EXAMINATION

A. Examine surfaces indicated to receive interior stone facing and conditions under which interior stone facing will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
   1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of interior stone facing.
   2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

3.3 SETTING STONE, GENERAL

A. Do necessary field cutting as stone is set. Use power saws with diamond blades to cut stone. Cut lines straight and true, with edges eased slightly to prevent snipping.

B. Contiguous Work: Provide reveals and openings as required to accommodate contiguous work.

C. Set stone to comply with requirements indicated. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure stone in place. Shim and adjust anchors, supports, and accessories to set stone accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.

D. Erect stone units' level, plumb, and true with uniform joint widths. Use temporary shims to maintain joint width.

E. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.
   1. Sealing of expansion and other joints is specified in Division 07 Section "Joint Sealants."
   2. Keep expansion joints free of plaster, mortar, grout, and other rigid materials.

3.4 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/8 inch in 96 inches (3 mm in 2400 mm), 1/4-inch (6 mm) maximum.

B. Variation from Level: For lintels, sills, chair rails, horizontal bands, horizontal grooves, and other conspicuous lines, do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), 3/8-inch (10 mm) maximum.

C. Variation of Linear Building Line: For position shown in plan and related portion of walls and partitions, do not exceed 1/8 inch in 96 inches (3 mm in 2400 mm), 1/4 inch in 20 feet (6 mm in 6 m), 3/8-inch (10 mm) maximum.

D. Variation in Cross-Sectional Dimensions: For thickness of walls from dimensions indicated, do not exceed plus or minus 1/8 inch (3 mm).

E. Variation in Joint Width: Do not vary joint thickness more than 1/16 inch (1.5 mm) or 1/4 of nominal joint width, whichever is less.

F. Variation in Plane between Adjacent Stone Units (Lipping): Do not exceed 1/32-inch (0.8-mm) difference between planes of adjacent units.

3.5 INSTALLATION OF STONE FACING

A. Set units firmly against setting spots. Locate setting spots at anchors and spaced not more than 18 inches (450 mm) apart across back of unit but provide no fewer than 1 setting spot per 2 sq. ft. (0.18 sq. m), unless otherwise indicated.
   1. Moisture Exposure: Use portland cement mortar for setting spots where stone is applied to inside face of exterior walls and at other locations where stone or cavity will be exposed to

moisture.

B. Set units on direct-mount anchoring system with anchors securely attached to stone and to backup surfaces. Comply with recommendations in ASTM C 1242.
   1. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with sealant indicated for filling kerfs.
   2. Set stone supported on clips or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths and to prevent point loading of stone on anchors. Hold shims back from face of stone a distance at least equal to width of joint.

C. Minimum Anchors: Provide anchors at a maximum of 24 inches (600 mm) o.c. around perimeter of interior stone facing panels with a minimum of 4 anchors per panel.

D. Minimum Anchors: Provide a minimum of 4 anchors per panel up to 12 sq. ft. (1.1 sq. m) in face area, plus a minimum of 2 additional anchors for each additional 8 sq. ft. (0.7 sq. m).

E. Grout or Point joints after setting as indicated.

3.6 INSTALLATION OF STONE BASE AND TRIM

A. Stone Base and Trim at Walls with Stone Paneling: Set units by adhering to interior stone facing with water-cleanable epoxy adhesive. Hold adhesive back from exposed edges of joints to allow for grouting.

B. Stone Base and Trim at Walls with Stone Paneling: Set units firmly against setting spots. Located setting spots at anchors and spaced not more than 18 inches (450 mm) apart, unless otherwise indicated. Provide no fewer than 2 anchors per piece for stone trim up to 48 inches (1200 mm) in length, plus 1 additional anchor for each additional 24 inches (600 mm) of length.

C. Stone Base and Trim at Walls without Stone Paneling: Adhere units to plywood backing with full spread of water-cleanable epoxy adhesive. Hold adhesive back from exposed edges of joints to allow for grouting.

D. Stone Base and Trim at Walls without Stone Paneling: Adhere units to gypsum board with full spread of organic water-cleanable epoxy adhesive. Hold adhesive back from exposed edges of joints to allow for grouting.

E. Assemble stone base and trim by bonding joints with stone adhesive as units are set. Mask areas adjacent to joints to prevent adhesive smears. Clamp units in place to ensure that surfaces are properly aligned, and joints are minimum width.

F. Grout or Point joints after setting.

3.7 GROUTING JOINTS

A. Grout stone to comply with ANSI A108.10.

1. Use sanded grout mixture for joints wider than 1/8 inch (3 mm).
2. Use unsanded grout mixture for joints 1/8 inch (3 mm) and narrower.

B. Remove temporary shims before grouting.

C. Tool joints uniformly and smoothly with plastic tool.

3.8 POINTING JOINTS WITH MORTAR

A. Prepare stone-joint surfaces for pointing with mortar by removing temporary shims, dust, and mortar particles. Where setting spots occur at joints, rake out excess setting mortar or plaster to a depth of not less than 1/2 inch (13 mm).

B. Point stone joints by placing pointing mortar in layers of not more than 3/8 inch (10 mm). Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer. Apply mortar first to areas where depths are greater than surrounding areas until a uniform depth is formed.

C. Tool joints when pointing mortar is thumbprint hard. Use a round jointer having a diameter 1/8 inch (3 mm) larger than width of joint.

3.9 JOINT-SEALANT INSTALLATION

A. Prepare joints and apply sealants of type and at locations indicated to comply with applicable requirements in Division 07 Section "Joint Sealants." Remove temporary shims before applying sealants.

3.10 ADJUSTING AND CLEANING

A. In-Progress Cleaning: Clean stone paneling as work progresses. Remove adhesive, grout, mortar, and sealant smears immediately.

B. Remove and replace stone paneling of the following description:
1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
2. Defective stone paneling.
3. Defective joints, including misaligned joints.
4. Interior stone facing and joints not matching approved Samples and mockups.
5. Interior stone facing not complying with other requirements indicated.

C. Replace in a manner that results in stone paneling that matches approved Samples and mockups, complies with other requirements, and shows no evidence of replacement.

D. Clean stone paneling no fewer than six days after completion of grouting and pointing, using clean water and soft rags or stiff-bristle fiber brushes. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that could damage stone.

E. Sealer Application: Apply stone sealer to comply with stone producer's and sealer manufacturer's

written instructions and recommendations.

3.11 PROTECTION

A. Protect stone surfaces, edges, and corners from construction damage. Use securely fastened untreated wood, plywood, or heavy cardboard to prevent damage.

B. Before inspection for Substantial Completion, remove protective coverings and clean surfaces.

3.12 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

END OF SECTION 097500

SECTION 099100
PAINTING

PART 1- GENERAL

1.1 SUMMARY

A. Work Included: Provide painting in accordance with the Contract Documents. The Work of this Section shall include the furnishing of all labor, material and equipment to perform a complete painting and/ or varnishing project as shown on the drawings provided during construction or as specified herein, but not limited to the following:
   1. Exterior and exposed interior items, areas, and surfaces.
   2. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
   3. Wood Stains and transparent finishes
   4. Wood repair products.

B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Resident Engineer will select from standard colors and finishes available.
   1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
   1. Prefinished items include the following factory-finished components:
      a. Architectural woodwork and casework.
      b. Metal toilet enclosures.
      c. Finished mechanical and electrical equipment.
      d. Light fixtures and electrical outlets.
   2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
      a. Foundation spaces.
      b. Furred areas.
      c. Ceiling plenums.
      d. Utility tunnels.
      e. Pipe spaces.
      f. Duct shafts.
      g. Elevator shafts.
   3. Finished metal surfaces (and hardware, unless factory primed) include the following:
      a. Anodized aluminum.
      b. Stainless steel.
      c. Chromium plate.
      d. Copper.
      e. Bronze and brass.
   4. Operating parts include moving parts of operating equipment and the following:
      a. Valve and damper operators.

b. Linkages.
c. Sensing devices.
d. Motor and fan shafts.
e. Sprinkler heads.
f. Operating systems controls.
g. Slots and seams which require opening and functioning.

5. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
6. Items of equipment furnished with complete factory finish, except for items specified to receive a finish coat as per this Section.
7. Do not re-prime any shop primed metal work unless specifically directed, or needed as barrier coat over incompatible primes.

D. Examine the requirements of the other technical Sections as to the location, extent and nature of painting work specified therein and include such items to be painted under this Section as are not included in the other Sections.

E. Related Sections include the following:
1. Division 5 Section “Structural Steel” for shop priming structural steel.
2. Division 6 Section “Interior Architectural Woodwork” for shop priming interior architectural woodwork.
3. Division 9 Section “Gypsum Board Assemblies” for surface preparation for gypsum board.

1.2 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
4. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.3 REFERENCES

A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
1. The Society for Protective Coatings (SSPC)
a. SSPC Volume 1 "Good Painting Practice"
b. SSPC Volume 2 "Systems and Specifications
2. The Painting and Decorating Subcontractors of America (PDCA): PDCA “Specification Manual”.

3. American Society for Testing and Materials (ASTM):
   a. ASTM D4261 “Practice for Surface Cleaning Unit Masonry for Coating”

1.4 SUBMITTALS

A. Product Data: For each paint system specified. Include block fillers and primers.
   1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer’s catalog number and general classification.
   2. Manufacturer’s Information: Provide manufacturer’s technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
   3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

B. Samples for Initial Selection: Manufacturer’s color charts showing the full range of colors available for each type of finish-coat material indicated.
   1. After color selection, the Architect will furnish color chips for surfaces to be coated.

C. Samples for Verification: Of each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate or on actual surfaces as directed by the Architect.
   1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
   2. Provide a list of materials and applications for each coat of each sample. Label each sample for location and application.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in scope, material and extent to that indicated for this Project with a record of successful in-service performance. The Contractor shall use only qualified journey men painters for the mixing and application of paint on exposed surfaces.

B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

C. The Contractor shall be wholly responsible for the satisfactory quality and completion of his work. He is responsible for inspecting the work areas prior to application of paint or finished materials.

D. The Contractor shall adhere to:
   1. NYC Administrative Code Title 6, Chapter 3, Subchapter 5, §6-313 “Volatile organic compounds and other airborne hazards” for all materials used.
   2. Local Law 1 of 2004- NYC Lead–based Paint regulations
   3. The NY State Table of Standards for Volatile Organic Compounds (“VOC”) limits In Architectural and Industrial Maintenance (AIM) Coatings.
   4. Local Law 120 of 2005- §6-313 VOC and other airborne hazards.
   5. The use of material or equipment inferior to that specified is not permitted under any

circumstances.

6. New York City Environmentally Preferable Products (“EPP”) Minimum Standards for Construction: The Contractor shall utilize products manufactured from environmentally preferable Materials as required by the EPP to a maximum extent possible. Contractor will be required to prove Materials meet the EPP standards upon request from DCAS by providing documentation such as Material Safety Data Sheets, product specifications, or other manufacturer documentation.
7. Product Specific Environmental Performance Standards:
   a. The Contractor shall utilize only paint that is free from toxic materials and heavy metals under normal conditions of use, which shall not contain benzene, hexavalent chromates, halogenated solvents, or mercury in excess of ten parts per million (10 PPM). Lead shall not exceed 0.06 percent (0.06%) of nonvolatile content. All paint shall comply with the latest Federal, New York State and New York City requirements for allowable restricted metals content.
8. Volatile Organic Compounds (“VOC”) – The Contractor shall ensure that all paint utilized under the Contract complies with the latest Federal, New York State and New York City requirements for the maximum allowable VOC content at the time of application.
   a. Primers: <200 g/L
   b. Flat Paint: <50 g/LNon-Flat Paint:
   c. <150 g/L
   d. Anti-Corrosive Paint: <250 g/L

   **All VOC requirements posted above are current as of January 2012. The Contractor shall comply with all the latest standards and may view the latest data and additional information on the US Green Building Council (“USGBC”) or LEED rating systems at www.usgbc.org.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project Site in manufacturer’s original, unopened packages and containers bearing manufacturer’s name and label, and the following information:
   1. Product name or title of material.
   2. Product description (generic classification or binder type).
   3. Manufacturer’s stock number and date of manufacture.
   4. Contents by volume, for pigment and vehicle constituents.
   5. Thinning instructions.
   6. Application instructions.
   7. Color name and number.
   8. VOC content.

B. Any container showing evidence of manufacturer’s seal being broken before delivery or otherwise not suitable for this work shall not be used in this work and must be removed from the project site immediately.

C. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.

D. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards

resulting from handling, mixing, and application.

E. All materials used or stored on site, including all paints, rags, solvents and flammable debris shall be carefully handled and shall be keep in suitable closed containers to avoid a fire hazard and shall be removed from the building as soon as possible.

1.7 PROJECT CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F (10 and 32 deg C).

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F (7.2 and 35 deg C).

C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
   1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to DCAS.
   1. (1) Quantity: The Contractor shall provide DCAS with the greater of one (1) gallon or five (5) percent of the paint materials and colors utilized on the project.

1.9 SCAFFOLDING AND LADDERS

A. The Contractor shall furnish his own scaffolding and ladders and shall be responsible for its strength and sufficiency. The Contractor is responsible for furnishing any and all scaffolding and ladders, sufficient and appropriate, for the size and/ or height of the painting project. All associated costs for scaffolding and ladders shall be deemed included.

1.10 SIGNAGE

A. The Contractor shall provide and post in conspicuous locations temporary signs for the direction and protection of the public and employees during the progress of the work.

PART 2- PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in the paint schedules.

B. Manufacturers Names: The following manufacturers are referred to in the paint schedules by use of shortened versions of their names, which are shown in parentheses:
   1. Benjamin Moore & Co. (Moore).
   2. Glidden Co. (The) (Glidden)..
   3. PPG Industries, Inc. (PPG).
   4. Minwax. (Minwax)
   5. White Board
   6. Tnemec Co. Inc (Steel)
   7. Or an Approved Equal

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another, and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
   1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
   2. Approved Equivalents: Upon review and approval by the Architect, paint materials "approved as equals" may be incorporated into the work.

C. Colors: Provide color selections made by the Architect.

D. Casein, resin emulsion or other similar paint will not be approved for this work.

E. Provide undercoat paint produced by the same manufacturer as the finish coats. All primers and under coats are to be tinted to the approximate shade of the selected finish coat. All tinting and thinning of materials shall be as recommended by the manufacturer for the material tinted or thinned.

F. Any materials not specifically covered and specified in this Contract which are necessary to complete the project (or as directed by the RE/PM or AM representative) shall be furnished and provided by the Contractor.

G. Stains and Coatings – General
   1. Unless otherwise indicated, provide factory-mixed materials. Mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials unless such procedure is specifically described in manufacturer's product instructions.
      a. Supply each material in quantity required to complete entire project's work from a single production run.

H. Back Primer for Transparent-Finished Woodwork: Or an Approved Equal
   1. Same as finish coat.
   2. 1 coat nitrocellulose lacquer sanding sealer; Minwax Lacquer Sanding Sealer (for use under

lacquer).
3. 1 coat vinyl toluene copolymer; Minwax Sanding Sealer (for use under polyurethane).

I. Wood Filler: Use one of the following, as appropriate to repair required: Or an Approved Equal
1. Shallow Nicks and Scratches: Minwax Blend-Fil Pencil.
2. Minor Scratches, Gouges, and Nail Holes: Minwax Wood Putty.
3. Gouges, Holes, Knot Holes, and Damaged Areas: Two-part, Minwax High Performance Wood Filler or Minwax Stainable Wood Filler.
4. To Reinforce Decayed Wood: Minwax High Performance Wood Hardener.
5. Stain Touch-Up: Minwax Wood Finish Stain Marker
6. Shellac, Lacquer, and Varnish Remover: Minwax Antique Furniture Refinisher.
7. Application Accessories: Provide all primers, sealers, cleaning agents, tools, cleaning cloths, sanding materials, and clean-up materials required.

PART 3- EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.
1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
1. Notify the RE/PM about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface- applied protection before surface preparation and painting.
1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.
1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Only skilled mechanics shall be employed. Application may be by brush or roller. Spray application only upon acceptance from the Architect in writing.

D. The Contractor shall furnish the Architect a schedule showing when he expects to have completed

the respective coats of paint for the various areas and surfaces. This schedule shall be kept current as the job progresses.

E. All suction spots or "hot spots" in plaster after the application of the first coat shall be touched up before applying the second coat.

F. Do not apply paint behind frameless mirrors that use mastic for adhering to wall surface.

G. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each substrate condition and as specified. Clean all painted surfaces of calamine, oil, grease, wax, loose, or peeling paint and other foreign matter that will prevent adhesion of the paint.
   1. The Contractor shall carefully examine all wall and floor surfaces and shall perform corrective measures to surfaces not suitable for painting. All cracks, holes and blemishes should be filled, sanded flush and then spot primed to match adjacent surfaces. Damaged or defective surfaces should be repaired by spackling or other appropriate method.
   2. The Contractor shall remove all peeling and scaling paint, nibs or projections by scraping and sanding. Surfaces that have been defaced with marking pens, crayons, etc. are to be solvent washed, then spot primed with "Benjamin Moore's PSP" or approved equal, to control residual "bleeding."
   3. The Contractor shall remove all loose and blistered paint on all surfaces and shall make the surfaces smooth with the application of a satisfactory and appropriate material. All surfaces must be thoroughly dry and free from dust, and no paint shall be applied over a previous coat until same has thoroughly dried. All repaired surfaces shall be thoroughly dry before painting, and shall be properly prepared, sized and primed. No excuse will be entertained if defects develop upon completion. Any missing surface preparation and/ or necessary materials (e.g. drywall, taping, lath or plaster, etc.) shall be repaired, plaster weld shall be used where required or as directed.
   4. Repairs and patching performed by the Contractor shall be brought flush and even with the adjoining surfaces, so that the finished paint surfaces shall be smooth and uniform. All rough or alligatored surfaces of woodwork or plaster shall be sandpapered or otherwise made smooth.
   5. Gloss surfaces shall be dulled by sanding lightly with # 00 sandpaper.
   6. Ceiling or walls that exhibit water stains shall be sealed with "Benjamin Moore's PSP" or an approved equal.
   7. Any paint spots, plaster, etc., both new and old, shall be thoroughly removed from all glass, metal, natural wood, flooring, etc., with dull finishing to be applied as directed.
   8. The Contractor shall consult the Architect in resolving any difficult conditions or in finishing any surface not otherwise covered by these requirements.
   9. Provide barrier coats over incompatible primers or remove and reprime.
   10. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted.
   11. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
      a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
      b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's written instructions.
      c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other

etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.

12. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
    a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried. Surface restoration compounds must be thoroughly cleaned with appropriate solvent.
    b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
    c. When transparent finish is required, backprime with spar varnish.
    d. Back prime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.
    e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
    f. Natural wood surfaces shall be lightly sanded, spot sealed and stained as necessary and given two coats of semi-gloss polyurethane.
    g. Presently varnished wood shall be washed with mild detergent, then rinsed off with clean water and given one coat of semi-gloss varnish.
13. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.
    a. Rusting surfaces must be wire-brushed and sanded free of rust. Metal works, doors, radiators, and windowsills, etc., shall be thoroughly washed, sanded, and primed if needed with rust inhibitive paint.
    b. Fill dents, cracks, hollow places, open joints, and other irregularities in
    c. Metal work to be painted with an approved metal filler suitable for the purpose; after setting, sand to a smooth, hard finish, flush with adjoining surface.
    d. Interior window frames, trim, doors and frames, ironwork and similar items presently painted in semi-gloss shall receive one coat semi-gloss enamel, finishing in smooth uniform surface sufficient to cover.
    e. Exposed radiator cover, pipes and exposed unpainted air conditioning ducts shall be painted with one coat of heat resistant primer and one coat of heat resistant paint sufficient to cover, similar to existing work. All bare or peeled surfaces shall be touched up and sanded, if necessary, before applying finish coat.
14. Metal Surfaces
    a. Weld Fluxes: Remove weld fluxes, splatters, and alkali contaminants from metal surfaces in an approved manner and leave surface ready to receive painting.
    b. Bare Metal: Thoroughly clean off all foreign matter such as grease, rust, scale and dirt before priming coat is applied. Clean surfaces, where solder flux has been used, with benzene. Clean surfaces by flushing with mineral spirits. For aluminum surfaces, wipe down with an oil free solvent prior to application of any pre-treatment.
        1) Bare metal to receive high performance coating specified herein must be blast cleaned SSPC SP-6 prior to application if field applied primer; coordinate with steel trades furnishing ferrous metals to receive this coating to insure that this cleaning method is followed.
        2) Concrete Floors: Shot blast floors to remove any deleterious materials from the surface that would prevent proper bond of the paint system.
        3) Concrete and Masonry Surface Preparations: Delay painting on concrete or masonry

surfaces as long as practicable within the limits of the Contract. Test surfaces for presence of alkali and neutralize as required. Test surfaces for moisture content and do not paint surfaces which exceed manufacture's printed instructions. Remove grease, oil, form release agents and efflorescence. Patch cracks and other blemishes to be covered by paint. Neutralize concrete surfaces which have received capillary waterproofing, utilizing materials and methods as recommended by the manufacturer and applicator of the capillary waterproofing.

a) Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled in accordance with manufacturer's instructions.
b) Clean concrete floors to be painted with a 5% solution of muriatic acid or another etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.

15. Block Masonry Surfaces: Thoroughly clean off all grit, grease, dirt mortar drippings or splatters, and other foreign matter. Remove nibs or projections from masonry surfaces. Fill cracks, holes or voids, not filled under the "Masonry" Section, with Portland cement grout, and bag surface so that it has approximately the same texture as the adjacent masonry surface.
16. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
17. Drywall Surfaces: Scrape off all peeling, scaling, projections, and splatters. Spackle surfaces as needed, thoroughly sand to feather edges smooth with adjacent surfaces. Cracks, depressions, and holes shall be filled, spackled and sanded smooth. Spackling shall be fully dry before primer sealer is applied.
18. Plaster: Plaster surfaces including the ceiling shall be spot prime with alkyd oil base primer sealer where surfaces are re-plastered or spackled. The finish coat for the walls shall be alkyd oil base flat or semi-gloss and the finish coat for the ceilings shall be alkyd oil base flat in addition to what is specified under preparation. If necessary, to secure a first-class uniform finish, additional coats shall be applied at no additional cost to the City.
19. Pipe Covering and Insulation, Surface Preparation: Clean surfaces of pipe, duct and equipment insulation (such as canvas jackets and troweled-on insulation), of loose, foreign and objectionable material prior to priming or sealing.
20. All existing surfaces finished in semi-gloss, gloss or baked enamel shall receive a primer sealer.
21. Materials Preparation: Mix and prepare paint materials according to manufacturer’s written instructions.
    a. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
    b. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
    c. Use only thinners approved by paint manufacturer and only within recommended limits.
22. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat but provide sufficient differences in shade of undercoats to distinguish each separate coat.
23. Touch-Up: Prime paint all patched portions in addition to all other specified coats.

3.3 APPLICATION

A. General: Apply paint according to manufacturer’s written instructions. Use applicators (brushes and rollers) and techniques best suited for substrate and type of material being applied. All paints shall

be evenly applied to secure a smooth finish and no excuse will be entertained upon completion.

B. Mix materials thoroughly before application to produce a mixture of uniform density; strain if necessary, before using. Do not mix surface film into material. If necessary, remove surface film and re-strain material before using. Do not adulterate ready-mixed materials except in accordance with the manufacturer's printed instructions. If no printed instructions appear on the container, obtain this information in writing from the manufacturer. Use only approved thinners and only within recommended limits.

C. "Exposed surfaces" is defined as those areas visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles, etc., are in place in areas scheduled to be painted.
1. Paint colors, surface treatments, and finishes are indicated in the schedules.
2. Do not paint over dirt, dust, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term “exposed surfaces” includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
5. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
6. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
7. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
8. Sand lightly between each succeeding enamel or varnish coat application with fine sandpaper or rub surfaces with pumice stone where required to produce an even, smooth surface in accordance with the coating manufacturer’s directions.
9. No “telegraphing” of lines, ridges, flakes, etc., through new surfacing is permitted.
10. All DCAS air conditioning numbers on outlet boxes shall be replaced after painting.
11. Coverage and hide shall be complete.
12. All materials shall be applied under adequate illumination, evenly spread and flowed-on smoothly to avoid runs, sags, brush marks, air bubbles and excessive roller stipple.

D. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer’s written instructions, sand between applications.
2. AM reserves the right to direct the Contractor to allow twenty-four (24) hours after applying the first coat and must receive AM approval before proceeding with the application of the second coat. The Contractor shall be responsible to provide sufficient number of coats to provide a uniform finish at no additional cost to the
3. City. Allow sufficient time between successive coatings and final coats to permit thorough and proper drying.
4. Omit primer on metal surfaces that have been shop primed and touch up painted.
5. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats

until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

6. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

E. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
4. Provide electrostatic painting to all metal materials as indicated in the drawings. All surfaces to be cleaned of any stickers and foreign materials, each piece to be hand sanded and washed down with a chemical cleaner.

F. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

G. Mechanical and Electrical Work: Painting of mechanical and electrical work which is not prefinished is limited to items exposed in equipment rooms and in occupied spaces.

H. Mechanical items to be painted include, but are not limited to, the following:
1. Piping, pipe hangers, and supports.
2. Heat exchangers.
3. Tanks.
4. Ductwork, duct hangers and supports.
5. Insulation.
6. Motors and mechanical equipment.
7. Accessory items.
8. Steel Dunnage

I. Electrical items to be painted include, but are not limited to, the following:
1. Conduit, distribution boxes and fittings.
2. Switchgear.
3. Panelboards, light, and power panels.
4. Pipes, hangers, and clamps.

J. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

K. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in

first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing. Apply additional coats of primer seal as required and/ or directed at no additional cost to the City.

L. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

M. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

N. Acoustic Tile: Great care shall be taken in applying the "Tesalite" Standard paint or approved equal to existing acoustic tile, to obtain a uniform job with one coat if possible, otherwise additional coats shall be applied to obtain a uniform finish at no additional cost to the City.

O. Lettering: The Contractor shall replace all lettering painted out with the same size, style and color lettering as existing per direction of the RE/PM.

3.4 INSTALLATION OF EPOXY WALL COATINGS

A. Surface Preparation
   1. Cementitious Surfaces
   2. Drywall Surfaces
      a. Dislodge dirt, plaster nibs, mortar spatter and other dry material by scraping or
      b. brushing. Remove dust and loose material by brushing, sweeping, vacuuming, or blowing with high-pressure air.
      c. Remove oil, wax, and grease by scraping off heavy deposits and cleaning with appropriate cleaning.
      d. Verify that surfaces to be coated are dry, clean, and free of dust, dirt, oil, wax, grease or other contaminants.
      e. Scrape or grind fins and protrusions flush with the surface.
      f. Patch holes and cracks flush with the surface, to match the host surface.
      g. Rake mortar joints clean.
      h. Remove surface laitance of efflorescence by acid etching or with abrasive blasting.

3.5 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
   1. After completing painting, clean any and all glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces. Remove all paint spots, plaster dust, films, etc. from all surfaces affected.
   2. Upon completion of work in any individual project area or location, that area shall be made ready for occupancy by vacuum and cleaning any and all accumulated dust from horizontal and vertical surfaces of walls, partitions, furnishings, flooring and equipment, etc.

3.6 PROTECTION

A. Protect work of other trades, and existing construction, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved and directed by RE/PM. The Contractor shall take all necessary precautions to protect all furnishings, surfaces and materials from paint, plaster, impacts, etc. and shall be held responsible for any damage. The Contractor shall remedy all damage caused by the work, or the work of any subcontractor, by repair, restoration and/ or replacement at his own expense.

B. Remove or protect hardware, accessories, plates, lighting fixtures, factory finished work and similar items or provide ample in-place protection. Upon completion, these same items will be re-installed or re-placed at their respective locations and in their original positions.

C. The Contractor will be required to move portable furniture such as desks, lockers, filing cabinets, bookcases and other equipment easily removed to paint behind them and replace same. The Contractor will not be required to paint behind large heavy storage cabinets, high stationary bookcases or shelving unless the occupants of the rooms arrange for their removal away from the walls or remove the materials and contents from the cabinets or shelves.

D. The Contractor will be required to remove, protect while painting and re-install on completion of painting, all pictures, shading devices, window treatments and louver blinds, etc. in the areas being painted.

E. All furnishings and equipment located in the area of the project shall be covered with polyethylene, fabric sheeting or drop clothes sufficient and appropriate for the size and scope of the work engaged.

F. Provide “Wet Paint” signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 EXTERIOR PAINT SCHEDULE

A. Concrete, Stucco, and Masonry (Other than Concrete Masonry Units): Provide the following finish systems over exterior concrete, stucco, and brick masonry surfaces:

1. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a primer.
    a. Primer: Alkali-resistant, exterior, acrylic-latex primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils (0.036 mm).
        i. Glidden: Primer not required over this substrate.
        ii. Moore: Moore’s Latex Exterior Primer #102.
        iii. PPG: 6-603 Speedhide Interior/Exterior Acrylic Latex Alkali Resistant Primer.
2. First and Second Coats: Semigloss, exterior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.4 mils (0.061 mm).
    i. Glidden: 6600 Series Spred Ultra Exterior Gloss Latex House & Trim Paint.
    ii. Moore: MoorGlo Latex House & Trim Paint #096.
    iii. PPG: 78 Line Sun-Proof Semi-Gloss Acrylic Latex House/ Trim Paint.

B. Smooth Wood: Provide the following finish systems over smooth wood siding and other smooth, exterior wood surfaces:
   1. Full-Gloss, Acrylic-Enamel Finish: 2 finish coats over a primer.
      a. Primer: Exterior, alkyd or latex, wood primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).
         i. Glidden: UH 450 Ultra-Hide Oil/Alkyd Exterior Primer.
         ii. Moore: Moorwhite Primer #100.
         iii. PPG: 72-1 Sun-Proof Exterior House & Trim Wood Primer Flat-- Latex.
      b. First and Second Coats: Full-gloss, waterborne, exterior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.4 mils (0.061 mm).
         i. Glidden: 6900 Series Lifemaster Pro Hi-Performance Acrylic Coating.
         ii. Moore: Impervex Enamel #309.
         iii. PPG: 90 Line Pitt-Tech One Pack Interior/Exterior High Performance Waterborne High Gloss DTM Industrial Enamels.
   2. Exterior Wood- Natural Clear Finish: Including doors, trim, soffits, and as indicated in the drawings.
      a. Satin: 3 coats oil-modified polyurethane; Minwax Clear Shield.
      b. Satin: 3 coats clear urethane; Minwax Helmsman Spar Urethane.
      c. Semi-Gloss: 3 coats oil-modified polyurethane; Minwax Clear Shield.
      d. Semi-Gloss: 3 coats clear urethane; Minwax Helmsman Spar Urethane.
      e. Gloss: 3 coats clear urethane; Minwax Helmsman Spar Urethane.
   3. Exterior Wood- Stained Finish: Including trim, doors, frames, and as indicated in the drawings.
      a. Minwax Gel Stain:
         1. 1 coat thixotropic soya alkyd non-drip stain and finish, Minwax Gel Stain.
         2. 2 coats thixotropic soya alkyd non-drip stain and finish, Minwax Gel Stain
         3. Colors: Indicated on drawings.
         4. Colors: To be selected by Architect from manufacturer's full range of available colors.

            Color as follows:
            - Aged Oak
            - Antique Maple
            - Brazilian Rosewood
            - Cherrywood
            - Chestnut
            - Honey Maple
            - Mahogany
            - Walnut
      b. Satin: 3 coats oil-modified polyurethane; Minwax Clear Shield.
      c. Satin: 3 coats clear urethane; Minwax Helmsman Spar Urethane.
      d. Semi-Gloss: 3 coats oil-modified polyurethane; Minwax Clear Shield.

e. Semi-Gloss: 3 coats clear urethane; Minwax Helmsman Spar Urethane.
f. Gloss: 3 coats clear urethane; Minwax Helmsman Spar Urethane.

4. Exterior Wood- Simulated Wood Grain Finish: Including trim, doors, frames, and as indicated in the drawings. Or an Approved Equal
   a. Minwax Gel Stain:
      1. 1 coat thixotropic soya alkyd non-drip stain and finish.
      2. 2 coats thixotropic soya alkyd non-drip stain and finish.
      3. Colors: Indicated on drawings.
      4. Colors: To be selected by Architect from manufacturer's full range of available colors.

      Color as follows:
      - Aged Oak
      - Antique Maple
      - Brazilian Rosewood
      - Cherrywood
      - Chestnut
      - Honey Maple
      - Mahogany
      - Walnut

   b. Satin: 3 coats oil-modified polyurethane; Minwax Clear Shield.
   c. Satin: 3 coats clear urethane; Minwax Helmsman Spar Urethane.
   d. Semi-Gloss: 3 coats oil-modified polyurethane; Minwax Clear Shield.
   e. Semi-Gloss: 3 coats clear urethane; Minwax Helmsman Spar Urethane.
   f. Gloss: 3 coats clear urethane; Minwax Helmsman Spar Urethane.

C. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.
   1. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a rust-inhibitive primer.
      a. Primer: Rust-inhibitive metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils (0.033 mm).
         i. Glidden: 5205 Glid-Guard Tank & Structural Primer, Red.
         ii. Moore: IronClad Retardo Rust-Inhibitive Paint #163.
         iii. PPG: 6-208 Speedhide Interior/Exterior Rust Inhibitive Steel Primer.
         iv. Tnemec
      b. First and Second Coats: Full-gloss, exterior, alkyd enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 3.0 mils (0.076 mm).
         i. Glidden: 4500 Series Glid-Guard Alkyd Industrial Enamel.
         ii. Moore: Impervo Enamel #133.
         iii. PPG: 6-282 Speedhide Interior/Exterior Gloss-Oil Enamel.

D. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated (galvanized) metal surfaces: Or an Approved Equal
   1. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a galvanized metal primer.
      a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than

1.2 mils (0.031 mm).
i. Glidden: 5205 Glid-Guard Tank & Structural Primer, Red.
ii. Moore: IronClad Galvanized Metal Latex Primer #155.
iii. PPG: 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel.

b. First and Second Coats: Full-gloss, exterior, alkyd enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm)
i. Glidden: 4500 Series Glid-Guard Alkyd Industrial Enamel.
ii. Moore: Impervo Enamel #133.
iii. PPG: 6-282 Speedhide Interior/Exterior Gloss-Oil Enamel.

E. Aluminum: Provide the following finish systems over exterior aluminum surfaces:
1. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a primer. Or an Approved Equal
a. Primer: Rust-inhibitive, acrylic- or alkyd-based, metal primer, as recommended by the manufacturer for use over aluminum, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils (0.036 mm).
i. Glidden: 5205 Glid-Guard Tank & Structural Primer, Red.
ii. Moore: IronClad Retardo Rust-Inhibitive Paint #163.
iii. PPG: 90-709 Pitt-Tech Primer.
b. First and Second Coats: Full-gloss, alkyd enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).
i. Glidden: 4500 Series Glid-Guard Alkyd Industrial Enamel.
ii. Moore: Impervo Enamel #133.
iii. PPG: 6-282 Speedhide Interior/Exterior Gloss Oil Enamel.

3.8 INTERIOR PAINT SCHEDULE

A. Concrete and Masonry (Other than Concrete Masonry Units): Provide the following paint systems over interior concrete and brick masonry surfaces: Or an Approved Equal.
1. Flat Acrylic Finish: 2 finish coats over a primer.
a. Primer: Alkali-resistant, acrylic-latex, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.0 mil (0.025 mm).
i. Glidden: 5111 Spred Ultra Latex Primer-Sealer.
ii. Moore: Regal First Coat Interior Latex Primer & Underbody #216.
iii. PPG: 6-2 Speedhide Interior Quick-Drying latex Sealer.
b. First and Second Coats: Flat, latex-based, interior paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils (0.064 mm).
i. Glidden: 4000 Series Spred Ultra Flat Latex Wall and Trim Paint.
ii. Moore: Regal Wall Satin #215.
iii. PPG: 80 Line Wallhide Interior Wall Flat Latex Paint.
2. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a primer.
a. Primer: Alkali-resistant, acrylic-latex, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not

less than 1.0 mil (0.025 mm).
i. Glidden: 5111 Spred Ultra Latex Primer-Sealer.
ii. Moore: Regal First Coat Interior Latex Primer & Underbody #216.
iii. PPG: 6-603 Speedhide Interior/Exterior Acrylic Latex Alkali Resistant Primer.

b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils (0.071 mm).
i. Glidden: 4100 Series Spred Ultra Eggshell Latex Wall & Trim Paint.
ii. Moore: Moore's Regal AquaVelvet #319.
iii. PPG: 89 Line Manor Hall Eggshell Latex Wall and Trim Enamel.

3. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a primer.
a. Primer: Alkali-resistant, acrylic-latex, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.0 mil (0.025 mm).
i. Glidden: Primer not required over this substrate.
ii. Moore: Regal First Coat Interior Latex Primer & Underbody #216.
iii. PPG: 6-603 Speedhide Interior/Exterior Acrylic Latex Alkali Resistant Primer on highly alkaline surfaces.

b. First and Second Coats: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).
i. Glidden: 8200 Series Spred Ultra Latex Semi-Gloss Enamel.
ii. Moore: Moore's Regal AquaGlo Vinyl-Acrylic Latex Enamel #333.
iii. PPG: 88-110 Satinhide Interior Enamel Wall & Trim Lo-Lustre Semi-Gloss Latex.

B. Concrete Masonry Units: Provide the following finish systems over interior concrete masonry block units: Or an Approved Equal
1. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a block filler.
a. Block Filler: High-performance, latex-based, block filler applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 5.0 mils (0.13 mm).
i. Glidden: 5317 Ultra-Hide Block Filler, Latex Interior-Exterior.
ii. Moore: Moorcraft Interior & Exterior Block Filler #173.
iii. PPG: 6-7 Speedhide Interior/Exterior Masonry Latex Block Filler.

b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils (0.071 mm).
i. Glidden: 4100 Series Spred Ultra Eggshell Latex Wall & Trim Paint.
ii. Moore: Moore's Regal AquaVelvet #319.
iii. PPG: 89 Line Manor Hall Eggshell Latex Wall and Trim Enamel.

c. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a block filler. Block Filler: High-performance, latex-based, block filler applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 5.0 mils (0.13 mm).
i. Glidden: 5317 Ultra-Hide Block Filler, Latex Interior-Exterior.
ii. Moore: Moorcraft Interior & Exterior Block Filler #173.

iii. PPG: 6-7 Speedhide Interior/Exterior Masonry Latex Block Filler.

d. First and Second Coats: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).
   i. Glidden: 8200 Series Spred Ultra Latex Semi-Gloss Enamel.
   ii. Moore: Moore's Regal AquaGlo Vinyl-Acrylic Latex Enamel #333.
   iii. PPG: 88-110 Satinhide Interior Enamel Wall & Trim Lo-Lustre Semi-Gloss Latex.

C. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces: Or an Approved Equal
   1. Flat Acrylic Finish: 2 finish coats over a primer.
      a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).
         i. Glidden: 5111 Spred Ultra Latex Primer-Sealer.
         ii. Moore: Regal First Coat Interior Latex Primer & Underbody #216.
         iii. PPG: 17-10 Quick-Drying Interior Latex Primer-Sealer.
      b. First and Second Coats: Flat, acrylic-latex-based, interior paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils (0.064 mm).
         i. Glidden: 4000 Series Spred Ultra Flat Latex Wall and Trim Paint.
         ii. Moore: Regal Wall Satin #215.
         iii. PPG: 80 Line Wallhide Interior Wall Flat Latex Paint.
   2. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a primer.
      a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).
         i. Glidden: 5111 Spred Ultra Latex Primer-Sealer.
         ii. Moore: Regal First Coat Interior Latex Primer & Underbody #216.PPG: 17-10 Quick-Drying Interior Latex Primer-Sealer.
      b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils (0.071 mm).
         i. Glidden: 4100 Series Spred Ultra Eggshell Latex Wall & Trim Paint.
         ii. Moore: Moore's Regal AquaVelvet #319.
         iii. PPG: 89 Line Manor Hall Eggshell Latex Wall and Trim Enamel.
   3. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a primer.
      c. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).
         i. Glidden: 5111 Spred Ultra Latex Primer-Sealer.
         ii. Moore: Regal First Coat Interior Latex Primer & Underbody #216.
         iii. PPG: 17-10 Quick-Drying Interior Latex Primer-Sealer.
      d. First and Second Coats: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).
         i. Glidden: 8200 Series Spred Ultra Latex Semi-Gloss Enamel.

ii. Moore: Moore's Regal AquaGlo Vinyl-Acrylic Latex Enamel #333.
iii. PPG: 88-110 Satinhide Interior Enamel Wall & Trim Lo-Lustre Semi-Gloss Latex.

D. Plaster: Provide the following finish systems over new, interior plaster surfaces: Or an Approved Equal.
1. Flat Acrylic Finish: 2 finish coats over a primer.
a. Primer: Alkali-resistant, acrylic-latex, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils (0.036 mm).
i. Glidden: 5111 Spred Ultra Latex Primer-Sealer.
ii. Moore: Regal First Coat Interior Latex Primer & Underbody #216.
iii. PPG: 6-603 Speedhide Interior/Exterior Acrylic Latex Alkali Resistant Primer.
b. First and Second Coats: Flat, acrylic-latex, interior paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils (0.064 mm).
i. Glidden: 4000 Series Spred Ultra Flat Latex Wall and Trim Paint.
ii. Moore: Regal Wall Satin #215.
iii. PPG: 80 Line Wallhide Interior Wall Flat Latex Paint.
2. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a primer. Or an Approved Equal.
a. Primer: Alkali-resistant, alkyd- or latex-based, interior primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).
i. Glidden: 5111 Spred Ultra Latex Primer-Sealer.
ii. Moore: Regal First Coat Interior Latex Primer & Underbody #216.
iii. PPG: 6-603 Speedhide Interior/Exterior Acrylic Latex Alkali Resistant Primer.
b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils (0.071 mm).
i. Glidden: 4100 Series Spred Ultra Eggshell Latex Wall & Trim Paint.
ii. Moore: Moore's Regal AquaVelvet #319.
iii. PPG: 89 Line Manor Hall Eggshell Latex Wall and Trim Enamel.
3. Semigloss, Acrylic-Enamel Finish: One finish coat over an undercoat and a primer. Or an Approved Equal.
a. Primer: Alkali-resistant, alkyd- or latex-based, interior primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).
i. Glidden: 5111 Spred Ultra Latex Primer-Sealer.
ii. Moore: Regal First Coat Interior Latex Primer & Underbody #216.
iii. PPG: 6-603 Speedhide Interior/Exterior Acrylic Latex Alkali Resistant Primer.
b. First and Second Coats: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).

i. Glidden: 8200 Series Spred Ultra Latex Semi-Gloss Enamel.
ii. Moore: Moore's Regal AquaGlo Vinyl-Acrylic Latex Enamel #333.
iii. PPG: 88-110 Satinhide Interior Enamel Wall & Trim Lo-Lustre Semi-Gloss Latex.

E. Woodwork and Hardboard: Provide the following paint finish systems over new, interior wood surfaces: Or an Approved Equal.
1. Semigloss, Alkyd-Enamel Finish: 2 finish coats over a primer.
a. Primer: Alkyd or latex-based, interior enamel under coater applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).
1) Glidden: UH 400 Ultra-Hide Alkyd Interior Enamel Under coater.
2) Moore: Moore's Alkyd Enamel Underbody #217.
3) PPG: 17-255 Quick-Drying Enamel under coater.
2. Interior Wood- Natural Oiled Finish: Including trim, molding, and as indicated in the drawings.
a. Low Luster Finish: 2 coats tung oil, hand rubbed; Minwax Tung Oil Finish.
b. Low Luster Finish: 3 coats tung oil, hand rubbed; Minwax Tung Oil Finish.
3. Interior Wood- Natural Clear Finish: Floors, Stairs and as indicated in the drawings:
a. Satin: 3 coats linseed oil-modified polyurethane; Minwax Fast-Drying Polyurethane.
b. Satin: 3 coats linseed oil-modified polyurethane; Minwax Super Fast-Drying Polyurethane for Floors.
c. Satin, Minwax Water Based:
1) 1 base coat, water dispersible oil-modified urethane; Minwax Water Based Base Coat.
2) 3 finish coats, water dispersible oil-modified urethane; Minwax Water Based Polyurethane for Floors.
d. Semi-Gloss: 3 coats linseed oil-modified polyurethane; Minwax Fast-Drying Polyurethane.
e. Semi-Gloss: 3 coats linseed oil-modified polyurethane; Minwax Super Fast- Drying Polyurethane for Floors.
f. Semi-Gloss, Minwax Water Based:
1) 1 base coat, water dispersible oil-modified urethane; Minwax Water Based Base Coat.
2) 3 finish coats, water dispersible oil-modified urethane; Minwax Water Based Polyurethane for Floors.
g. Gloss: 3 coats linseed oil-modified polyurethane; Minwax Fast-Drying Polyurethane.
h. Gloss: 3 coats linseed oil-modified polyurethane; Minwax Super Fast-Drying Polyurethane for Floors.
i. Gloss, Minwax Water Based:
1) 1 base coat, water dispersible oil-modified urethane; Minwax Water Based Base Coat.
2) 3 finish coats, water dispersible oil-modified urethane; Minwax Water Based Polyurethane for Floors.
4. Interior Wood- Natural Clear Finish: Including trim, doors, frames, cabinets, paneling, and as indicated in the drawings, not for use on floors or stairs.
a. Satin: 2 coats linseed oil-modified polyurethane; Minwax Fast-Drying

Polyurethane.

b. Semi-Gloss: 2 coats linseed oil-modified polyurethane; Minwax Fast-Drying Polyurethane.
c. Gloss: 2 coats linseed oil-modified polyurethane; Minwax Fast-Drying Polyurethane.

5. Interior Wood- Natural Clear Finish: Including trim, doors, frames, and as indicated in the drawings, not for use on floors or stairs.
   a. Preparation as specified by manufacturer.
   b. Satin: 2 coats polyurethane; Minwax Wipe-On Poly.
   c. Gloss: 2 coats polyurethane; Minwax Wipe-On Poly.
6. Interior Wood Finish- Floors and Stairs:
   a. Stain: Minwax Wood Finish.
      1) 1 coat modified linseed oil/hydrocarbon resin stain; Minwax Wood Finish.
      2) 2 coats modified linseed oil/hydrocarbon resin stain; Minwax Wood Finish.
      3) 1 coat modified linseed oil/hydrocarbon resin stain; Wood Finish Aerosol Spray.
      4) 2 coats modified linseed oil/hydrocarbon resin stain; Wood Finish Aerosol Spray.
      5) Colors: Indicated on drawings.
      6) Colors: To be selected by Architect from manufacturer's full range of available colors.
   b. Stain: Minwax Gel Stain.
      1) 1 coat thixotropic soya alkyd non-drip stain and finish; Minwax Gel Stain.
      2) 2 coats thixotropic soya alkyd non-drip stain and finish; Minwax Gel Stain.
      3) Colors: Indicated on drawings.
      4) Colors: To be selected by Architect from manufacturer's full range of available colors.
   c. Satin: 2 coats linseed oil-modified polyurethane; Minwax Fast-Drying Polyurethane.
   d. Satin: 2 coats linseed oil-modified polyurethane; Minwax Super Fast-Drying Polyurethane for Floors.
   e. Semi-Gloss: 2 coats linseed oil-modified polyurethane; Minwax Fast-Drying Polyurethane.
   f. Semi-Gloss: 2 coats linseed oil-modified polyurethane; Minwax Super Fast-Drying Polyurethane for Floors.
   g. Gloss: 2 coats linseed oil-modified polyurethane; Minwax Fast-Drying Polyurethane.
   h. Gloss: 2 coats linseed oil-modified polyurethane; Minwax Super Fast-Drying Polyurethane for Floors.
7. Interior Wood- Stain with Clear Finish- Oil-Based Stain: Including trim, doors, frames, cabinets, paneling, and as indicated in the drawings, but not floors or stairs.
   a. On Softwoods: 1 coat Minwax Pre-Stain Wood Conditioner.
   b. Stain: Minwax Wood Finish.
      1) 1 coat modified linseed oil/hydrocarbon resin stain; Minwax Wood Finish.
      2) 2 coats modified linseed oil/hydrocarbon resin stain; Minwax Wood Finish.
      3) Colors: Indicated on drawings.
      4) Colors: To be selected by Architect from manufacturer's full range of available colors.

c. Stain: Wood Finish Aerosol Spray.
   1) 1 coat modified linseed oil/hydrocarbon resin stain; Wood Finish Aerosol Spray.
   2) 2 coats modified linseed oil/hydrocarbon resin stain; Wood Finish Aerosol Spray.
   3) Colors: Indicated on drawings.
   4) Colors: To be selected by Architect from manufacturer's full range of available colors.

d. Stain: Minwax Pastels.
   1) 1 coat alkyd and oil-modified polyurethane stain; Minwax Pastels.
   2) 2 coats alkyd and oil-modified polyurethane stain; Minwax Pastels.
   3) Colors: Indicated on drawings.
   4) Colors: To be selected by Architect from manufacturer's full range of available colors.

e. Stain: Minwax Gel Stain.
   1) 1 coat thixotropic soya alkyd non-drip stain and finish; Minwax Gel Stain.
   2) 2 coats thixotropic soya alkyd non-drip stain and finish; Minwax Gel Stain.
   3) Colors: Indicated on drawings.
   4) Colors: To be selected by Architect from manufacturer's full range of available colors.

f. Low Luster Finish: 2 coats paste wax, hand rubbed; Minwax Paste Finishing Wax.

g. Satin: 2 coats linseed oil-modified polyurethane; Minwax Fast-Drying Polyurethane.

h. Satin: 2 coats polyurethane; Minwax Wipe-On Poly.

i. Semi-Gloss: 2 coats linseed oil-modified polyurethane; Minwax Fast- Drying Polyurethane.

j. Gloss: 2 coats linseed oil-modified polyurethane; Minwax Fast-Drying Polyurethane.

8. Interior Wood- Stain with Clear Finish: Including trim, doors, frames, cabinets, paneling, and as indicated in the drawings, not for use on floors or stairs.
   a. On Softwoods: 1 coat Minwax Water Based Pre-Stain Wood Conditioner.
   b. Stain: Minwax Water Based Wood Stain.
      1) 1 coat water-based stain; Minwax Water Based Wood Stain.
      2) 2 coats water-based stain; Minwax Water Based Wood Stain.
      3) Colors: Indicated on drawings.
      4) Colors: To be selected by Architect from manufacturer's full range of available colors.
   c. Low Luster Finish: 2 coats paste wax, hand rubbed; Minwax Paste Finishing Wax.
   d. Satin: 2 coats linseed oil-modified polyurethane; Minwax Fast-Drying Polyurethane.
   e. Semi-Gloss: 2 coats linseed oil-modified polyurethane; Minwax Fast-Drying Polyurethane.
   f. Gloss: 2 coats linseed oil-modified polyurethane; Minwax Fast-Drying Polyurethane.

9. Interior Wood- Stain with Clear Finish- One-Step: Including trim, doors, frames, cabinets, paneling, and as indicated in the drawings, but not floors or stairs.
   a. On Softwoods: 1 coat Minwax Pre-Stain Wood Conditioner.

b. Soft Luster: 2 coats thixotropic alkyd, soya oil-modified polyurethane stain and finish; Minwax Woodsheen Rubbing Oil Stain & Finish.
c. Colors: Indicated on drawings.
d. Colors: To be selected by Architect from manufacturer's full range of available colors.
e. Satin: 2 coats soya uralkyd stain and finish; Minwax Polyshades.
f. Gloss: 2 coats soya uralkyd stain and finish; Minwax Polyshades.
g. Colors: Indicated on drawings.
h. Colors: To be selected by Architect from manufacturer's full range of available colors.

10. Interior Wood- Simulated Wood Grain Finish: Including trim, doors, frames, cabinets, and as indicated in the drawings.
a. Minwax Gel Stain: 2 coats thixotropic soya alkyd non-drip stain and finish.
b. Colors: Indicated on drawings.
c. Colors: To be selected by Architect from manufacturer's full range of available colors.
d. Use Minwax Graining Tool, match Architect's sample of finish.
e. Satin: 2 coats linseed oil-modified polyurethane; Minwax Fast-Drying Polyurethane.
f. Semi-Gloss: 2 coats linseed oil-modified polyurethane; Minwax Fast-Drying Polyurethane.
g. Gloss: 2 coats linseed oil-modified polyurethane; Minwax Fast-Drying Polyurethane.

F. Ferrous Metal: Provide the following finish systems over ferrous metal: Or Approved Equal.
1. Semigloss, Alkyd-Enamel Finish: One finish coat over an enamel undercoater and a primer.
a. Primer: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils (0.038 mm).
i. Glidden: 5207 Glid-Guard Tank & Structural Primer, White.
ii. Moore: IronClad Retardo Rust-Inhibitive Paint #163.
iii. PPG: 6-208 Speedhide Interior/Exterior Rust Inhibitive Steel Primer.
b. Undercoat: Alkyd, interior enamel undercoat or semigloss, interior, alkyd- enamel finish coat, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to
achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).
i. Glidden: UH 8400 Ultra Traditional Alkyd Semi-Gloss Enamel.
ii. Moore: Moore’s Alkyd Enamel Underbody #217.
iii. PPG: 6-6 Speedhide Interior Quick-Drying Enamel Undercoater.
c. Finish Coat: Odorless, semigloss, alkyd, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils (0.036 mm).
i. Glidden: UH 8400 Ultra Traditional Alkyd Semi-Gloss Enamel.
ii. Moore: Satin Impervo #235.
iii. PPG: 27 Line Wallhide Low Odor Interior Enamel Wall and Trim

Semi-Gloss Oil.

G. Cotton or Canvas Covering over Insulation: Provide the following finish system on cotton or canvas insulation covering: Or an Approved Equal.
   1. Flat Acrylic Finish: 2 finish coats. Add fungicidal agent to render fabric mildew proof.
      a. First and Second Coats: Flat, latex-based, interior paint applied at spreading rate recommended by the manufacturer.
         i. Glidden: 4000 Series Spred Ultra Flat Latex Wall and Trim Paint.
         ii. Moore: Regal Wall Satin #215.
         iii. PPG: 6-700 Series Speedhide Ultra Interior Wall Flat Latex 100 Percent Acrylic.

3.10 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

B. The Architect and/ or RE/PM reserves the right to specify the finish coat within the range of flat, eggshell, satin, semi-gloss, full-gloss and/ or high gloss, etc. without additional cost to the City.

END OF SECTION 099100

SECTION 099101
PAINT REMOVAL

PART 1- GENERAL

1.1 SUMMARY

A. Work included: Provide paint stripping work in accordance with the Contract Documents. The Work of this Section shall include but not be limited to the following:
   1. Remove paint and finishes from woodwork.
   2. Remove paint from ironwork and provide one coat of primer.
   3. Remove paint from masonry.
   4. Comply with all Governmental regulations regarding removal of lead based paint.
   5. Protect pedestrian and vehicular traffic, adjacent materials and buildings, workers, and building occupants and contents during paint stripping.

B. Related Work of Other Sections: The following related work is to be performed under the designated sections.
   1. Division 1 Specification "Removal and Disposal of Lead-Containing Paint."
   2. Division 9 Specification "Painting."

1.2 QUALITY ASSURANCE

A. The Contractor or subcontractor performing the Work of this Section, must during the last five (5) years prior to bid opening, as a prime contractor or subcontractor have successfully completed in a timely fashion at least two (2) projects similar in scope and type to the required work in this Contract (i.e. paint removal work on buildings that are considered landmark, landmark quality or buildings of equivalent historical or architectural significance).

B. The Contractor shall comply with all applicable OSHA regulations for lead based paint removal, including Lead in Construction (29 CFR 1926.62) and Hazard Communication Standard (29 CFR 1910.1200).

C. The Contractor shall comply with all applicable Federal, state, and local regulations for the containment, labeling, storage, transportation, and disposal of hazardous waste.

D. Field tests for chemical stripping: For chemical paint removal methods, prepare the following test panels prior to beginning work. Prepare a separate test panel of each product specified herein. Prepare a separate set of test panels for each different material to be stripped.
   1. Preparation of test panels shall be done in the presence of DCAS. Provide minimum 48 hours notice prior to performing tests.
   2. Provide 2' x 2' area using each type of paint stripper specified. Repeat testing as needed to achieve specified results and as directed by DCAS.

E. All Subcontractors are bound by the same requirements as the Contractor. Subcontractors shall not begin work unless approved by DCAS.

F. The Contractor shall maintain a steady work crew made up of qualified craftsmen and a full time foreman who reads and speaks fluent English. The Contractor shall confirm that all workmen

understand the job's requirements.

G. Metal Cleaning Standards: Cleaning of metals shall conform to the Requirements of the Steel Structures Painting Council (SSPC).

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, material safety data sheets, and general recommendations for each specified product. Include test reports and certificates substantiating the product's compliance with the specified requirements.

B. Program of Work:
   1. Prior to the start-up of work, submit written description of protection to be employed during the course of the work. Do not begin work until submittal has been approved. Include description of materials and attachments and other information as needed to completely describe method of protection for workers, the general public, other building elements, vehicular traffic, and the sidewalk.
   2. If alternate methods and materials to those specified are proposed for any phase of the work, provide written description. Provide evidence of successful use on comparable projects and demonstrate their effectiveness for use on this project.

C. Testing: Testing to be performed by accredited laboratory. Submit qualifications of laboratory and obtain written approval from DCAS prior to performing specified tests.

1.4 PROJECT CONDITIONS

A. The coatings on all elements to be stripped may contain lead based paint. Take all necessary precautions to protect all persons (whether engaged in the work of this Section or not) from all hazards of any kind associated with the work of this Section. Perform all work of this Section in accordance with all Federal, State, and local regulations regarding the containment, labeling, storage, transportation and disposal of the waste products involved.
   1. The City shall test paint for the presence of lead and will notify the Contractor if lead is present. If the Contractor must disturb paint which has not been tested, and which the Contractor suspects may contain lead, the Contractor must inform DCAS who will arrange for the testing of the paint. The Contractor shall not proceed with the work until the presence or absence of lead in the paint has been confirmed.

B. The Contractor shall be responsible for confirming that employee exposure to lead released by work of this Section is below OSHA Permissible Exposure Limit.

C. Take all necessary precautions to prevent fire and spread of fire.

D. Where work is performed at the building exterior, pedestrian and vehicular traffic shall be completely protected from damage caused by any part of the work of this Section. It is the Contractor's responsibility to protect the work area in a safe and legal manner.

E. The interior of the building will be occupied and in use during the work of this contract. The Contractor shall take all necessary precautions to protect all people in the building from any hazards which may arise from the work of this section.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Follow manufacturer's guidelines concerning temperature requirements for products specified herein.

B. Store all materials in spaces designated by the City. All such spaces shall meet pertinent City, State and Federal code and fire regulation standards and shall be locked and inaccessible to those not employed under this section, except the City's Representatives. All storage spaces shall maintain the minimum storage temperatures recommended by the product manufacturers.

PART 2- PRODUCTS

2.1 MATERIALS

A. Provide the following alkaline based and non-methylene chloride solvent based chemical paint removal products:
   1. "Heavy Duty Paint Stripper", as manufactured by ProSoCo, Inc., or an Approved Equal.
   2. "EnviroStrip #2, and #3 as manufactured by ProSoCo, Inc., or an Approved Equal.
   3. "Peel Away I" and "Peel Away 7" as manufactured by Dumond Chmicals, or an Approved Equal.
   4. "Back to Nature 1" and "Back to Nature 4" as manufactured by Dynacraft Industries.
   5. "Back to Nature 2, "Back to Nature 3, and "Back to Nature 8" as manufactured by Dynacraft Industries.
   6. Or an Approved Equal

B. Products for neutralizing alkaline paint removers:
   1. "Heavy Duty Restoration Cleaner", manufactured by ProSoCo, Inc., Kansas City, KS, or An Approved equal.
   2. Or an Approved Equal

C. Hand tools with vacuum attachments. Acceptable manufacturers include:
   1. Desco Manufacturing Company, Long Beach, CA, 800-337-2648.
   2. The Marindus Company, Englewood, NJ, (201) 567-8383.
   3. Or an Approved Equal

D. Scrapers for removing paint residue
   1. Scrapers shall be shaped to follow the profiles of the work to be stripped. It may be necessary to custom grind tools for this work, in order not to damage the profiles of the substrate.

E. Primers for Ferrous Metals
   1. Primer for abrasive blast cleaned iron: Series 90-97 Tneme-Zinc, manufactured by Tnemec Company, Inc. Provide 2.5- 3.5 mil dry film thickness. Provide onecoat.
   2. Primer for metal cleaned to SP11: Series 135 ChemBuild, manufactured by Tnemec Company, Inc., Woburn, MA. Provide 4- 6 mil dry film thickness.
   3. Or an Approved Equal

PART 3- PART 3 – EXECUTION

3.1 STRIPPING: GENERAL

A. Coatings on all elements contain lead based paint. Protect workers and general public from hazards associated with lead-based paint removal. Contain, store, transport, and dispose of waste in accordance with all applicable regulations.

B. Protect adjacent materials from damage by the paint stripping agents. Damage to adjacent materials shall be repaired by the Contractor to the satisfaction of DCAS at no additional cost to the City.

3.2 APPLICATIONS, GENERAL

A. Apply cleaning and stripping materials to comply with the manufacturer's recommendations and to match the results obtained in the approved test applications.

B. Perform cleaning and stripping in a manner which results in uniform results on all surfaces, including corners and moldings, without streaking or damage. Do not gouge or disfigure the substrate.

C. Use the least aggressive method necessary to remove all paint from specified surfaces.

D. On completion of stripping, clean residue from treated surfaces and neutralize surface if necessary.

3.3 PAINT REMOVAL METHODS, GENERAL

A. At the Contractor's option, prior to the start of wet chemical paint stripping methods, vacuum all surfaces to remove loose and flaking paint to the greatest extent possible without damaging the substrate. Use vacuums equipped with HEPA filters only.

B. Ensure that debris created by wet chemical methods does not come in contact with other building elements, the sidewalk or landscaping, vehicular traffic, workers not performing work under this section, or the general public.

C. Ensure that methods used do not damage existing surfaces being stripped.

3.4 CHEMICAL PAINT REMOVAL METHODS

A. Remove all paint, corrosion, and scale from galvanized sheet metal using wet chemical methods.

B. Selection
   1. Use solvent based paint strippers for stripping paint from wood elements.
   2. Test both alkaline and solvent based strippers on masonry and metal.

C. Strip all coatings using the following procedure. Procedure is subject to modification during the mock-up phase.
   1. Install protection to ensure that chemical paint stripper and waste products created do not come in contact with other building elements, the sidewalk, vehicular traffic, workers not performing work under this section, or the general public.

2. Apply chemical paint stripper as directed by the manufacturer. Allow to dwell for approved time, as determined by test panels and as approved by DCAS. Cover with plastic sheeting if necessary to ensure that stripper does not dry out.
3. Manually scrape off paint stripper and softened paint to the greatest extent possible.
4. Repeat process as needed to remove all traces of paint and other coatings.
5. Rinse exterior surfaces using pressurized water.
   a. Water pressure shall be maximum of 500 psi. Pressure rinser shall have a working pressure gauge.
6. Rinse all surfaces to be stripped on the interior of the building with solvents recommended by the manufacturer of the paint stripper.
7. Neutralize surfaces as directed and as required by paint stripper used.
   a. Rinse exterior surfaces using pressurized water. Water pressure shall be maximum of 500 psi. Pressure rinser shall have a working pressure gauge.

D. Peelable Paint Remover: For masonry surfaces containing lead-based paint, remove paint from masonry surfaces as follows:
1. Apply 1/4” layer of paste using corrosion resistant trowel or other suitable applicator. Apply paper backing and press it into the paste.
2. Allow 24-48 hour dwell time or time determined by DCAS.
3. If stripper becomes dry and is no longer flexible, mist the surface with water until the stripper is softened.
4. Remove the stripper and dissolved paint by inserting a corrosion resistant spatula, trowel, or other suitable scraping device through the paste and carefully lifting the paint and paste from the surface in one piece. Remove as much residue from the surface as possible.
5. If paint remains on the surface, repeat steps 1 through 4.
6. Rinse using pressurized water.
7. When all the paint is removed, neutralize the surface with an acidic afterwash if required by the Manufacturer. Dilute the afterwash according to the manufacturer’s recommendations. Brush apply the solution in a gentle scrubbing manner.
8. Allow the solution to remain on the surface according to the manufacturer’s recommendations.
9. Pressure rinse with water. Rinse from the bottom to the top, covering each section of the surface with a concentrated stream of water.
10. Verify the neutralization of the surface by testing for pH.

3.5 MECHANICAL PAINT REMOVAL METHODS

A. Use mechanical methods specified below to remove loose and deteriorated paint coatings from metal surfaces.

B. Ensure that all damaged coatings are removed. Provide sound, stable surface for the application of new paint coatings.

C. Clean metal surfaces to standards of Steel Structures Painting Council (SSPC) SP11.

3.6 PROCEDURES FOR REMOVABLE FERROUS METAL UNITS

A. Remove ferrous metal units from site.

B. Remove ferrous metal units to shop for removal of paint and corrosion by abrasive grit blasting.

C. Immediately following grit blasting procedure, wipe cleaned metal with solvent recommended by primer manufacturer and apply prime paint.

3.7 PROCEDURES: ABRASIVE GRIT BLASTING

A. Abrasive blasting shall be used for the removal of paint from all iron items to be removed from the site for restoration.

B. Remove all paint and scale from all surfaces, both interior and exterior of all cast iron, by abrasive grit blasting to bare metal. Blasting procedures shall comply with the standards of the Steel Structures Painting Council (SSPC).

C. Blasting procedures shall comply with all Federal, State, and local regulations for the containment and disposal of blasting material and paint. Laborers shall be equipped with proper protective clothing, equipment, and training according to OSHA and all other applicable regulations.

3.8 CLEAN-UP AND PROTECTION

A. Clean-up: Properly contain all run-off from stripping. Remove rubbish, rags and effluent from the site at the end of each workday, in appropriately marked containers.

B. Protection: Protect the work of other trades against damage by stripping work. Correct any damage by cleaning, repairing, or replacing, as acceptable to DCAS, at no additional cost to the City.

C. Removal and disposal of paint residue and stripping materials shall comply with all Federal, State, and local regulations. Workers shall be equipped with proper protective clothing, equipment, and training according to OSHA and all other applicable regulations.

3.9 MEASUREMENT AND PAYMENT

3.10 Unit Prices – SEE BID SHEET

END OF SECTION 099101

SECTION 101400
SIGNAGE AND IDENTIFYING DEVICES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. The Work of this Section includes all labor, materials, equipment and services necessary to complete the identifying devices as shown on the drawings and/ or specified herein. The Work shall include but not be limited to the following:
   1. Interior and exterior etched metal dimensional plaque signs.
   2. Interior acrylic plaque signs with subsurface graphics.
   3. Interior photopolymer signs.
   4. Etched metal dimensional plaque signs
   5. Interior acrylic plaque signs with subsurface graphics
   6. Interior photopolymer signs

1.3 RELATED SECTIONS

A. Division 4 Section – “Unit Masonry.”

B. Division 9 Section – “Gypsum Plastering.”

C. Division 9 Section – “Gypsum Board Assemblies.”

1.4 QUALITY ASSURANCE

A. For actual installation of the identifying devices, use only personnel who are thoroughly familiar with the manufacturer's recommended methods of installation and who are completely trained in the required skills.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each type of identifying device required. Provide materials, dimensions of individual components, profiles,
   and finishes for each type of identifying device required.Shop Drawings: Submit shop drawings for fabrication and erection of identifying devices. Include location plans, elevations, and large-scale sections of typical members and other components.
   1. Provide message list for each sign required, including full size layout of text, graphics and tactile elements. Provide layout with selected font styles.
   2. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.

B. Samples: Submit samples of each identifying device and component for initial selection of color,

pattern and surface texture as required and for verification of compliance with requirements.

1.6 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.7 PROJECT CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

1.8 QUALITY ASSURANCE

A. Compliance: Provide signs that comply with all ADA code requirements for accessibility.

B. Single-Source Responsibility: For each separate type of sign required, obtain signs from one source from a single manufacturer.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include but are not limited to the following:
   1. ASI Sign Systems Inc.
   2. Diskey Sign Corporation.
   3. Scott Sign System, Inc.
   4. ACE Sign Systems, Inc.
   5. A.R.K. Ramos Architectural Signage
   6. Gemini Incorporated
   7. Metallic Arts
   8. Or an Approved Equal.

2.2 MATERIALS

A. Cast Acrylic Sheet: Provide cast (not extruded or continuous cast) methyl methacrylate monomer plastic sheet, in sizes and thicknesses indicated, with a minimum flexural strength of 16,000 psi when tested in accordance with ASTM D 790, a minimum allowable continuous service temperature of 176 deg F (80 deg C).

B. Bronze Plate: Provide bronze plate, copper alloy UNS C28000, Muntz metal, 60 percent copper.

C. Stainless Steel Plate, Sheet, and Strip: Provide stainless steel plate, sheet, or strip, AISI Type 302, complying with requirements of ASTM A 167.

D. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers.

E. Colored Coatings for Acrylic Plastic Sheet: Use colored coatings, including inks and paints for copy and background colors that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are non-fading for the application intended.

F. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.

G. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.3 METAL PLAQUE SIGNS

A. Panel Signs: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
   1. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.

B. Unframed and Framed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to conform with the requirements indicated on drawings.

C. Laminated Sign Panels: Permanently laminate face panels to backing sheets of material and thickness indicated using the manufacturer’s standard process.

D. Brackets: Fabricate brackets and fittings for bracket-mounted signs from extruded aluminum to suit sign panel construction and mounting conditions indicated. Factory- paint brackets in a color matching the background color of the sign panel.

E. Graphic Content and Style: Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices.

F. Metal Etched Copy: Photochemical copy, graphics and braille by the photochemical process, relief or incised. Precisely formed, uniformly opaque paint filled complying with requirements, size, style, spacing, content, position and colors.

G. Acrylic Subsurface Copy: Equal to SPG Laminated Plaques. Subsurface graphics applied to sign face second surface with precisely formed uniformly opaque graphics that complies with requirements indicated and of colors, size, style, spacing, content, position and colors selected. Laminate clear acrylic panel over base panel.

H. Photopolymer Copy: Tactile copy and braille raised 1/32 inch from plaque first surface by photochemical stratification process. Precisely formed, uniformly spaced opaque graphics to comply with ADA requirements and of size, style spacing, content, position and colors required.

2.4 FINISHES

A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by the RE/PM from the manufacturer's standards.

B. Metal Finishes: Comply with NAAMM "Metal Finishes Manual" for finish designations and applications recommendations.

C. Bronze Finishes: Finish designations prefixed by "CDA" conform to the system established by the Copper Development Association for designating finishes. Or Approved Equal
   1. Natural Satin Finish: CDA-M31O6x (Mechanical Finish: Fine satin directional textured; Clear Organic Coating: Manufacturer's standard air-dry clear organic coating as specified below).
   2. Clear Organic Coating: Air-dried acrylic coating Incralac as developed by International Copper Research Corporation, 1.0-mil minimum dry thickness.
   3. Stainless Steel Finishes: Finish designations prefixed by "AISI" conform to the system established by the American Iron and Steel Institute for designating finishes.
      a. Bright, Directional Polish Finish: AISI No. 4 finish with grain direction as selected by Architect.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where identifying devices is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Locate sign units and accessories where indicated or as directed by the Architect. Use mounting methods of the type described and in compliance with the manufacturer's instructions.
   1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.
   2. Utilize concealed theft-resistant fasteners as indicated.
   3. Coordinate with other trades for installation of sign units to finish surfaces.
   4. Repair or replace damaged units as directed by the Architect.

B. Wall Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated below:

1. Silicone-Adhesive Mounting: Use liquid silicone adhesive recommended by the sign manufacturer to attach sign units to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended by the sign manufacturer to hold the sign in place until the adhesive has fully cured.
2. Shim Plate Mounting: Provide manufacturer's recommended concealed mounting methods for secure attachment to the substrate.

3.3 CLEANING AND PROTECTION

A. At completion of the installation, clean soiled sign surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

3.4 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

B. All signs furnished and installed per this Section shall include "Braille" writing, deemed included in the Unit Price, at no additional cost to the City.

END OF SECTION 101400

SECTION 101410
PHOTOLUMINESCENT EGRESS SYSTEMS

PART 1- GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. The Work of this Section includes all labor, materials, equipment, and services necessary to complete the photoluminescent egress systems as shown on the drawings and/ or specified herein, including, but not necessarily limited to, the following:
1. Stair nosings.
2. Stair and landing edge marking.
3. Side edge marking.
4. Handrail marking.
5. Obstacle marking.
6. Floor demarcation lines.
7. Door hardware marking.
8. Exit door frame strips.
9. Directional signage.
10. Door signs.

1.3 RELATED SECTIONS

A. Steel pan stairs- Section 055100.

1.4 PERFORMANCE REQUIREMENTS

A. Photoluminescent egress marking systems shall comply with Building Code Standard RS 6-1 and RS 6-1A of the New York City Building Code, Section 27-383(b), for photoluminescent exit path markings.

B. Comply with ASTM E 2072-04 "Standard Specification for Photoluminescent Safety Markings."

1.5 QUALITY ASSURANCE

A. For actual installation of the photoluminescent egress systems, use only personnel who are thoroughly familiar with the manufacturer's recommended methods of installation and who are completely trained in the required skills.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each type of product required.

B. Shop Drawings: Submit shop drawings showing sizes, locations, graphics, and text of signs; installation details of each type of sign or marking; and mounting details, where appropriate, with fasteners indicated for each specific project substrate.

C. Certification: Provide certification that all photoluminescent products proposed to be used for the project meet the minimum requirements of the reference standard as regards brightness rating, washability, toxicity, radioactivity and flame spread.

D. Provide proof that photoluminescent material has M.E.A. approval for use in New York City.

1.7 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation, and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2- PRODUCTS

2.1 MANUFACTURERS AND MATERIALS

A. Photoluminescent Paint for Handrails: Afterglo High performance Photoluminescent Paint (HPP012DGNK-P) as manufactured by DHI, Defense Holdings , Inc. 9105-B Owens Drive, Manassas Park, VA20111. www.dh-inc.com. Or an Approved Equal.

B. Photoluminescent Marking system at Egress Stairs and Landing Nosings: Liqui-Glo as manufactured by Glowzone 620 Lunar Avenue, Suite B, Brea CA 92821- 3112 Tel: 714- 256-2202. www.glowzoneinc.com. Or an Approved Equal.

2.2 PHOTOLUMINESCENT STAIRWAY MARKINGS

A. Stair Nosings: Provide Liqui-Glo as manufactured by Glowzone. Or an Approved Equal

B. Stair Handrails: Provide AfterGlo High Performance Photoluminescent Paint. Or an Approved Equal

C. Stair and Landing Edge Marking: 1" wide photoluminescent paint located as indicated on drawings, to identify the limits of steps and leading edge of landings.

D. Side Edge Marking: As designed to meet requirements for existing buildings; 1" wide photoluminescent paint designed to illuminate ends of existing stair tread surfaces.

E. Handrail Marking: Fabricated from contoured aluminum, with beveled finish edge and minimum 1" wide photoluminescent paint, located as indicated on drawings, for application to handrails.

F. Obstacle Marking: As required for marking obstacles along an egress route, including, but not limited to, standpipes, hose cabinets, wall projections, restricted-height areas, etc.; provide 1" wide diagonally striped photoluminescent paint,, height and location as indicated on drawings or required by referenced standards.

G. Floor Demarcation Lines: 1" wide photoluminescent paint,, suitable for both wall and floor mounted applications.
1. For wall-mounted applications, provide 1/4" thick extruded aluminum channel with photoluminescent paint, for installation to uneven surfaces using screws provided by manufacturer.
2. For attachment to doors, provide 1.901" high by 0.916" thick sill with 1" wide photoluminescent paint,, attached to door using screws provided by manufacturer.

H. Door Hardware Marking: Photoluminescent material to illuminate door opening mechanisms, required at all Intermediate and Final Exit doors. Locate behind, immediately adjacent to, or on the door handle and/ or escutcheon, as indicated on drawings. Provide manufacturer's standard latch type and/ or door bar type, as required.

I. Exit Door Frame Paint: As required for Intermediate and Final Exit doors, provide the following:
1. 1" or 2" wide photoluminescent paint, for attachment to door frame.
2. Photoluminescent Head and Jamb Seal: 0.081" wide by 0.301" thick seal with photoluminescent paint,, screw-attached to door frame.

J. Directional Signage: Photoluminescent signs with directional arrow and pictogram, placed in stairwell or exit at every entrance, visible upon opening into the stairwell or exit, of type required to indicate appropriate direction of egress and to meet referenced standards.

K. Door Signs: Photoluminescent signs with directional arrow, pictogram and/ or text, as required, mounted on door or wall adjacent to door; of type required to indicate Intermediate or Final Exit, or to indicate "Exit Through Lobby" or "Not an Exit." Provide type of sign and location as indicated on drawings or required by referenced standard.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where photoluminescent egress systems is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION OF PHOTOLUMINESCENT PAINT AT HANDRAILS

A. Surface Preparation.
1. General:
   a. Perform preparation and cleaning procedures in compliance with the coating manufacturer's instructions for the particular substrate conditions, and as herein specified.

B. Application:
1. Apply product when air and surface temperatures are between 50d eg. And 90 deg. F.
2. Apply product over manufacturer provided white base coat and when dry to touch.
3. Carefully mask-off area not to receive photoluminescent paint to avoid overspray and paint build up.
4. Spray apply an even coat of Afterglo and allow at least one hour to dry. Apply a second coat to achieve the recommended mill thickness.
5. Spray apply a clear cover coat following manufacturer’s instructions.

3.3 INSTALLATION OF PHOTOLUMINESCENT MARKING SYSTEM AT EGRESS STAIRS LANDINGS AND NOSINGS

A. Surface Preparation:
1. Verify that surfaces to be coated are dry, clean and free of dust, dirt, oil, wax, grease or other contaminants.

B. Application:
1. Follow Manufactures instructions on application of stencil tape. To ensure alignment use a laser line for accuracy.
2. Apply Zinsser Buls Eye 1-2-3 P following manufactures application instructions.

C. Load components into cartridge and dispense only the amount required to set up within 30 seconds. Dispense an even bead on material within the stencil tape and immediately spread evenly with a 4-inch putty knife to fill space uniformly.

END OF SECTION 101410

SECTION 102113
TOILET COMPARTMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. Work Included: Provide toilet compartments in accordance with the Contract Documents. The Work of this Section shall include the furnishing of all labor, materials and equipment necessary and required to completely install all steel toilet partitions and screens as indicated on the drawings provided during construction and as specified herein, including but not be limited to the following:
   1. Type: Steel, color-coated finish and stainless steel compartments.
   2. Compartment Style: Overhead braced and floor anchored or ceiling hung
   3. Toilet compartment hardware, brackets, anchoring and accessories
   4. Urinal screens: Wall hung

B. Related Sections include the following:
   1. Gypsum board partitions- Section 092900
   2. Ceramic tile- Section 093000
   3. Toilet accessories- Section 102800

1.2 REFERENCES

A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
   1. American Welding Society (AWI)
      a. AWS D1.1 "Structural Welding Code- Steel".
      b AWS D1.3 "Structural Welding Code- Sheet Steel".
   2. National Association of Architectural Metal Manufacturers (NAAMM)
      a. NAAMM "Metal Finishes Manual"
   3. Industrial Fasteners Institute (IFI): "Fastener Standards Book."

1.3 QUALITY ASSURANCE

A. Basis of Design: When particular manufacturers' materials, products or processes are specified for an item of Work, any one thereof is acceptable for the Contractor to choose. An alternative material, product or process will be considered if the Contractor submits a written substitution request together with such information as may be necessary to assist the Consultant in determining whether the proposed substitution is acceptable; the burden of proof rests solely upon the Contractor.

B. Qualified Installer: The toilet compartment work shall be performed by a firm having 5 years experience in the installation of specified materials on comparable projects. The firm shall have the approval of the toilet compartment materials manufacturer. The applicator shall provide

evidence of successful completion of work of similar scope to that shown and specified for this Project using similar toilet compartment systems.

C. Sole Source Responsibility: Obtain toilet compartment from one source of a single manufacturer. Obtain accessory products used in conjunction with toilet compartment from the toilet compartment manufacturer or from sources acceptable to the toilet compartment manufacturer. The manufacturer shall furnish evidence that the specified materials have been manufactured by the same source and successfully utilized on a yearly basis for a minimum of 5 years on projects of a similar scope to that shown and specified for this Project.

D. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from authorities having jurisdiction.

E. Size Variations: Obtain Consultant's acceptance of manufacturer's standard size units, which may vary slightly from sizes indicated.

F. Field Measurements: Take field measurements prior to fabrication to ensure proper fitting of the work.

G. Inserts and Anchorages: Furnish inserts and anchoring devices which must be built into other work for the installation of toilet partitions and related work. Coordinate delivery with other work to avoid delay.

1.4 SUBMITTALS

A. Product Data: For each type and style of toilet compartment and screen specified. Include details of construction relative to materials, fabrication, and installation. Include details of anchors, hardware, and fastenings.

B. Quality Control Submittals: Submit for Consultant’s information.
   1. Certifications
      a) Document Review: Before commencing work, submit a written statement signed by the Contractor and the Installer certifying that the Contract Documents, shop drawings and product data have been reviewed with material manufacturers' qualified technical representatives and that they agree the selected materials are proper, compatible with contiguous materials and adequate for the application shown.

C. Shop Drawings: For fabrication and installation of toilet compartment and screen assemblies. Include plans, elevations, sections, details, and attachments to other work.
   1. Show locations of reinforcement and cutouts for compartment-mounted toilet accessories.
   2. Show detailed layout of work, fabrication, erection, anchoring, jointing, construction, etc., for Architect’s approval.

D. Setting Drawings: Submit for Consultant’s information. Provide setting drawings and templates for the location of metal anchorage items that are to be embedded in or anchored to concrete, masonry or anchored to gypsum wallboard including location of partition reinforcing.

E. Samples for Initial Selection: Manufacturer's color charts consisting of sections of actual units showing the full range of colors, textures, and patterns available for each type of compartment or screen indicated.

F. Samples for Verification: Of each compartment or screen color and finish required, prepared on 6-inch (150-mm) square Samples of same thickness and material indicated for Work.

G. Templates: Submit templates to other trades as required for support of toilet partitions..

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Examination: Verify all ceiling conditions for ceiling hung installations and notify RE/PM immediately of any conditions that would cause delay in the Work.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Accurate Partitions Corporation.
2. All American Metal Corp.
3. American Sanitary Partition Corp.
4. Ampco Products, Inc.
5. Bobrick Washroom Equipment, Inc.
6. Flush- Metal Partition Corp.
7. General Partitions Mfg. Corp.
8. Global Steel Products Corp.
9. Knickerbocker Partition Corporation.
10. Metpar Corp.
11. Sanymetal Products, Co.
12. Or an Approved Equal.

2.2 MATERIALS

A. General: Provide materials that have been selected for surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are unacceptable.

B. Steel Sheets for Color-Coated Finish: Provide mill-phosphatized steel sheet that is leveled to stretcher-leveled flatness complying with the requirements of standards indicated below:
1. Hot-Dip Galvanized or Galvannealed Steel Sheet: ASTM A 653 (ASTM A 653M), in manufacturer's standard coating designation and of the following minimum

thicknesses:

(a) Pilasters (Overhead Braced): 0.040 inch (1.0 mm).
(b) Panels and Screens: 0.040 inch (1.0 mm).
(c) Doors: 0.034 inch (0.85 mm).
(d) Tapping Reinforcement: 0.079 inch (2.0 mm).

C. Stainless-Steel Sheet: ASTM A 666, Type 302 or 304, that is leveled to stretcher-leveled flatness, finished on exposed faces as indicated in the "Stainless-Steel Sheet Finishes" Article, and of the following minimum thicknesses:
1. Pilasters (Overhead Braced): 0.0375 inch (0.95 mm).
2. Pilasters (Unbraced): 0.0500 inch (1.3 mm).
3. Panels and Screens: 0.0375 inch (0.95 mm).
4. Doors: 0.0312 inch (0.8 mm).
5. Tapping Reinforcement: 0.0781 inch (2.0 mm).

D. Core Material for Metal-Faced Units: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of 1 inch (25 mm) minimum for doors, panels, and screens and 1-1/4 inches (32 mm) minimum for pilasters.

E. Pilaster Shoes and Sleeves (Caps): ASTM A 666, Type 302 or 304 stainless steel, not less than 0.0312 inch (0.8 mm) thick and 3 inches (75 mm) high, finished to match hardware.

F. Stirrup Brackets: Manufacturer's standard ear or U-brackets for attaching panels and screens to walls and pilasters of the following material:
1. Material: Stainless steel.

G. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories of the following material:
1. Material: Stainless steel.
2. All hardware except hooks shall be through bolted. One way type theft and vandal proof screws and fasteners shall be provided..

H. Hardware and Fittings : All panel and pilaster brackets and all door hardware shall be chrome plated zinc die castings. Fasteners are zinc plated 12 x 1-3/4" and 12 x 5/8" TR-27 6-lobe security screws. Doors shall be equipped with a gravity type hinge mounted on the lower pilaster hinge bracket. Door hinges shall be fully concealed within the thickness of the door and adjustable to permit the door to come to rest at any position when not latched. Each door to be fitted with a combined coat hook and bumper and a concealed latch, with face mortised flush with edge strip of door. Barrier- free doors shall include thumbturn lever to activate latch without fingertip grip application. Both standard and barrier-free latches shall have a turn slot designed to allow emergency access from exterior. The combined stop and keeper shall have a 19mm (0.75") diameter bumper locked in place. Threaded upper hinge pin shall have a metal core and self-lubricating nylon sleeve to ensure smooth, quiet operation. Pilaster shoes shall be a welded one-piece design made from polished stainless steel. Two- piece shoes that can disassemble when kicked are unacceptable.

I. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with anti-grip profile in manufacturer's standard finish.

J. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant- type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

K. Fittings for ceiling hung stainless steel toilet compartment:
1. Wall brackets shall be stainless steel. Door strikes and hinges shall be fastened by means of "one-way" head tamper proof stainless steel steel bolts.
2. All pilasters to have a 3" high stainless steel shoe, 14 gauge minimum. Hinge brackets and stops shall have clamp flanges to transmit the strain of door closing to the pilaster.

2.3 FABRICATION

A. General: Provide standard doors, panels, screens, and pilasters fabricated for compartment system. Provide units with cutouts and drilled holes to receive compartment-mounted hardware, accessories, and grab bars, as indicated.
1. Provide internal reinforcement in metal units for compartment-mounted hardware, accessories, and grab bars, as indicated.

B. Stainless Steel Toilet Compartment:
1. Doors, panels and pilasters shall be constructed of 2 face plates, with formed edges, assembled over and cemented under pressure to the sound deadening core. The formed edges shall be bound, locked and sealed with die-drawn locking strips which shall hold the plates with a tension grip. The outer face of the locking strips shall be uniformly rounded, except the strip on the panel edge in contact with the pilaster, which shall be flat. Locking strips shall be mitered and welded corners with welds ground smooth, and doors shall be further strengthened by internally brazing or welding the locking strips to the formed edges halfway in elevation on each side.
2. Doors and panels shall finish uniformly one (1) inch thick and pilasters shall finish uniformly 1-1/4" thick, with a tolerance of 1/32" inches plus or minus in each case. Surfaces shall be smooth and free from wave, warp and buckle. Doors, panels and pilasters shall have concealed tapped reinforcement for the attachment of hardware. Variations in width of enclosures, where necessary, shall be made by varying the width of the doors, leaving width of pilasters uniform.
3. Doors, panels and pilasters shall be formed as if one piece, flush, rack-proof unit that will remain flat under torsional stress.
4. Panels shall be attached to pilasters by not less than 3 hooks. The hooks shall be built into the contact edge of the panel and shall be designed to draw the panel and pilaster together with a tension grip when inserted into vertical openings in the pilaster and forced downward.
5. Pilaster bases shall be stainless steel, with clamp flanges for attachment to panels and pilasters and shall be provided with 2 holes for bolting to the wall.

C. Metal-Faced Toilet Compartments and Screens: Pressure laminate seamless face sheets to core material and provide continuous, interlocking molding strip or lapped and formed edges. Seal corners by welding or clips. Grind exposed welds smooth.

D. Overhead-Braced-and-Floor-Anchored Compartments: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor

conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.

E. Floor-Anchored Compartments: Provide manufacturer's standard corrosion-resistant anchoring assemblies complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

F. Wall-Hung Screens: Provide units in sizes indicated of same construction and finish as compartment panels, unless otherwise indicated.
   1. Provide metal-faced screens with integral full-height flanges for attachment to wall.

G. Floor-Anchored Screens: Provide pilasters and panels of same construction and finish as toilet compartments. Provide manufacturer's standard corrosion-resistant anchoring assemblies complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

H. Doors: Unless otherwise indicated, provide 24-inch (610-mm) wide in-swinging doors for standard toilet compartments and 36-inch (914-mm) wide out-swinging doors with a minimum 32-inch (813-mm) wide clear opening for compartments indicated to be handicapped accessible. Doors shall be provided with gravity, spring-loaded hinges with stainless steel cam, and corrosion resistant pintles concealed within the door.
   1. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold door open at any angle up to 90 degrees or closed when not latched. Upper hinge shall have a pivot pin of stainless steel, to be recessed and inset into edge of door approximately 2" below top of door, operating in a self-lubricating bushing, mounted, within the door structure, supported both above and below the pivot bracket. Hinge shall operate without raising or lowering the door on a fixed horizontal plane.
   2. Latch and Keeper: Manufacturer's standard surface-mounted latch unit with combination rubber-faced door strike and keeper designed for emergency access. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be handicapped accessible.
   3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories. Combination coat hook and bumper shall be fitted with renewable rubber bumper, have a minimum projection of 3-5/8 inches with base not less than 1- 1/2" x 2", or 1-3/4" diameter. Mount in center of door with center of base 3 inches below the top edge, with 1/4" through bolt fastening of acorn cone unit.
   4. Door Bumper: Manufacturer's standard rubber-tipped bumpers at out-swinging doors or entrance screen doors.
   5. Door Pull: Manufacturer's standard unit that complies with accessibility requirements of authorities having jurisdiction at all doors. Provide units on both sides of doors at compartments indicated to be handicapped accessible. Door pulls shall be cast chrome plated brass.
   6. Push Plate: Push plate shall be 2-3/4 x 10 inches, chrome plated brass and shall be mounted with the bottom of the plate 30 inches from the bottom edge of the door.

2.4 ZINC- OR ZINC-ALLOY-COATED STEEL SHEET FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products"

for recommendations relative to applying finishes.

B. Color-Coated Finish: Provide manufacturer's standard baked finish complying with coating manufacturer's written instructions for pretreatment, application, baking, and minimum dry film thickness.
   1. Color: One color in each room as selected by the Architect from manufacturer's full range of colors.

2.5 STAINLESS-STEEL SHEET FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
   1. Remove or blend tool and die marks and stretch lines into finish.
   2. Grind and polish surfaces to produce uniform, directional textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
   3. All corners shall be mitered, welded and ground smooth.

B. Finish: Satin Finish or Smooth and Textured # 304 Stainless Steel and as specified by the Architect or RE/PM.

C. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

D. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

PART 3 – EXECUTION

3.1 GENERAL

A. Manufacturer's Instructions: Prepare substrates and install the work of this Section, including components and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified, and where project conditions require extra precautions or provisions to ensure satisfactory performance of the Work.

3.2 EXAMINATION

A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

B. Coordination: Furnish inserts and anchorages which must be built into other work for installation of toilet compartments and related work; coordinate delivery with other work to avoid delay.

3.3 PREPARATION

A. Substrate Acceptability: Inspect areas and accept surfaces designated to receive toilet compartments, as satisfactory for the reception of the Work specified in this Section. Commencement of installation shall constitute acceptance of substrate conditions by the Installer.

3.4 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, plumb, and level. Provide clearances of not more than 1/2 inch (13 mm) between pilasters and panels and not more than 1 inch (25 mm) between panels and walls. Secure units in position with manufacturer's recommended anchoring devices.
   1. Secure panels to walls and panels with not less than 2 stirrup brackets attached near top and bottom of panel. Locate wall brackets so holes for wall anchors occur in masonry or tile joints. Align brackets at pilasters with brackets at walls.
   2. Each wall bracket shall be through bolted to the panel with 1/4-inch bolts with spanner heads and attached to the wall with two 1/4 inch bolts of suitable type.

B. Overhead-Braced-and-Floor-Anchored Compartments: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than 2 fasteners. Hang doors and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

C. Floor-Anchored Compartments: Set pilaster units with anchors penetrating not less than 2 inches (50 mm) into structural floor, unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.

D. Screens: Attach with anchoring devices according to manufacturer's written instructions and to suit supporting structure. Set units level and plumb and to resist lateral impact.

E. Ceiling Hung Compartments:
   1. Each pilaster shall be supported independent of the finished floor and fastened to the structural slab above by means of a built-in, welded, anchoring device designed to transmit the strains of lateral thrust and pull to the structure through two, 3/8-inch diameter, cadmium-plated stub bolts secured in expansion shields having a penetration of not less than 2 inches into the structural concrete. The anchoring device shall be readily accessible for leveling, plumbing, and tightening the installation, and shall be concealed by base fitting.
   2. All evidence of drilling, cutting and fitting of wall and/ or ceiling finish shall be concealed by the finished work. The clearance at vertical edges of doors shall be uniform from top to bottom and shall not exceed 3/16 inch.
   3. The Contractor is responsible to cut and fit, accurately and neatly, all anchoring device components. The Contractor shall be responsible to repair any and all damage caused by the installation to the ceiling or suspended ceiling system at no additional cost to the City.

F. Verify all measurements and dimensions at the Project site and coordinate the Work with the work of other trades. Allow for adjustments within specified clearances wherever taking field measurements before fabrication might delay work. Erect work rigidly; straight, plumb and

level. Conceal field drilling, cutting and fitting into the finished work. Adjust hardware for proper operation and leave in good working condition.

G. Comply with manufacturer's recommended procedures and installation sequence. Install compartments rigid, straight, plumb, and level. Locate wall brackets so that holes for wall anchorages occur in masonry or tile joints. Secure panels to pilasters with not less than two stirrup brackets located to align with stirrup brackets at wall. Secure panels in position with manufacturer's recommended anchoring devices.

3.5 ADJUSTING AND CLEANING

A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer’s written instructions for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out- swinging doors and swing doors in entrance screens to return to fully closed position.

B. Brackets shall be adjusted to provide uniform clearances not exceeding:
Pilaster and wall: 1 inch
Panels and wall: 1 inch
Pilasters and panels: 1/2 inch
Pilasters and doors: 3/16 inch

C. Provide final protection and maintain conditions that ensure toilet compartments and screens are without damage or deterioration at the time of Substantial Completion.

D. Upon completion of the Work, the Contractor shall thoroughly clean all Work per manufacturer’s recommendations. Finished surfaces shall be cleaned and left free of imperfections.

3.6 CLEANING

A. Clean surfaces and leave free from smears. Repair minor scratches and other finish imperfections. Replace damaged work. Provide protection as necessary to prevent damage during remainder of construction period.

3.7 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

END OF SECTION 102113

SECTION 102600
WALL AND DOOR PROTECTION

PART 1- GENERAL

1.1 SUMMARY

A. Drawings and Contract Documents apply to this Section.

B. Work Includes:
   1. Wall guards.
   2. Corner guards.

C. Related Requirements:
   1. Section 061000- Rough Carpentry

1.2 SUBMITTALS

A. Product Data: Product data for each wall surface protection system component and installation accessory required. Include:
   1. Physical characteristics such as dimensions of individual components and profiles, and finishes.
   2. Performance characteristics such as durability, impact strength, resistance to fading, and flame resistance.
   3. Installation methods for each type of substrate.

B. Shop Drawings: For each type of wall protection showing locations, extent, and installation details of wall and corner guards, and other protection systems. Include plans, elevations, and sections. Show methods of attachment to adjoining construction.

C. Samples for Initial Selection: For initial selection of color, pattern and surface texture, provide the manufacturer's standard color chips consisting of actual sections of each vinyl plastic material required showing the full range of materials, colors, and textures available.

D. Samples for Verification: Submit the following samples, prepared from the same material to be used in the Work, for verification of each color, pattern, and texture selected and for compliance with requirements indicated.
   1. Wall Guards: 12 inches long. Include examples of joinery, corners, end caps, top caps, and field splices.
   2. Corner Guards: 12 inches long. Include example top caps.

E. Product test reports from a qualified independent testing laboratory showing compliance of wall surface protection system components with requirements indicated based on tests performed by the laboratory within the past five years.

F. Maintenance data for wall surface protection system components.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: Provide certification of compliance with performance characteristics.

B. Sample Warranty: For special warranty.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced Installer who has previously installed wall surface protection systems similar in scope, material, and extent to the systems indicated for this Project.

B. Manufacturer Qualifications: Firm experienced in manufacturing wall surface protection system components that are similar to those required for this Project and that have a record of successful in-service performance.

C. Single Source Responsibility: Obtain each color, grade, finish, and type of wall surface protection system component from a single source with resources to provided products of consistent quality in appearance and physical properties without delaying progress of the Work.

D. Design Criteria: The drawings indicate the size, profile and dimensional requirements of wall surface protection system components required and are based on the specific types and models indicated. Wall surface protection system components by other manufacturers may be considered provided deviations in dimensions and profiles are minor and do not change the design concept as judged by the Architect. The burden of proof of equality is on the proposer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, quality or grade, and fire hazard classification.

B. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
   1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
   2. Store plastic wall- and door-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F, prior to installation.
   3. Keep plastic materials out of direct sunlight.
   4. Store corner-guard covers in a vertical position and wall guard covers in a horizontal position.

1.6 MAINTENANCE

A. Maintenance Instructions: Provide the manufacturer’s instructions for maintenance of installed work. Include recommended methods and frequency for maintaining optimum condition under anticipated traffic and use conditions. Include precautions against cleaning materials and methods that may be detrimental to finishes and performance.

B. Replacement Materials: Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels

describing contents.

1. Wall-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of cover installed, but no fewer than two, 96-inch- long units.
2. Corner-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of cover installed, but no fewer than two, 48-inch- long units.
3. Mounting and Accessory Components: Amounts proportional to the quantities of extra materials. Package mounting and accessory components with each extra material.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Do not install wall surface protection system components until the space is enclosed and weatherproof and until the ambient temperature within the building is maintained at not less than 70 deg F (21 deg C) for not less than 72 hours prior to beginning of the installation. Do not install rigid plastic wall surface protection systems until that temperature has been attained and is stabilized.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
      b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.
   2. Warranty Period: Five years from date of Substantial Completion.

PART 2- PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain wall- and door-protection products from single source from single manufacturer.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products for wall surface protection which may be incorporated into the Work include, but are not limited to, the following:
   1. American Floor Products Co., Inc.
   2. Balco, Inc.
   3. Brown Manufacturing Co.
   4. Construction Specialties, Inc.
   5. K. J. Miller Corporation.
   6. A. R. Nelson Co., Inc.
   7. Pawling Corporation.
   8. Tepromark International, Inc.
   9. Tri-Guards, Inc.
   10. Tubular Specialties.
   11. Wilkinson Company, Inc.

12. Altro Whiterock
13. Or an Approved Equal.

2.2 PERFORMANCE REQUIREMENTS

A. Fire Performance Characteristics: Provide wall surface protection system components that are identical to those tested in accordance with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 450 or less.

B. Impact Strength: Provide wall surface protection system components with a minimum impact resistance of 25.4 ft. x lb/sq. ft. (370 J/sq. m) when tested in accordance with ASTM D 256 (Izod impact, ft. x lb/in. (J/m) notch).

C. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1.

2.3 MATERIALS

A. Rigid Plastic Material: Extruded, textured, chemical- and stain-resistant, high-impact, polyvinyl chloride (PVC) or acrylic modified vinyl plastic, thickness as indicated. Comply with specified requirements of ASTM D 256 for impact resistance and ASTM E 84 for flame spread and smoke developed characteristics.
   1. Colors and Textures of Plastic Material: Provide extruded plastic material that matches colors and textures indicated by reference to the manufacturer’s standard color and texture designations.

B. Aluminum Extrusions: Provide alloy and temper recommended by the manufacturer for the type of use and finish indicated, but with not less than the strength and durability properties specified in ASTM B 221 (ASTM B 221M) for 6063-T5.

C. Stainless Steel: AISI Type 304, stainless steel plate, minimum 0.06 inch (1.5 mm), No. 4 satin finish.

D. Fasteners: Provide aluminum, nonmagnetic stainless steel, or other non-corrosive metal screws, bolts, and other fasteners compatible with aluminum components, hardware, anchors, and other items being fastened. Use theft-proof fasteners where exposed to view.

2.4 WALL GUARDS

A. Crash Rail Type Wall Guards: Heavy-duty assembly consisting of continuous snap-on plastic cover installed over concealed retainer; designed to withstand impacts.
   1. Cover shall be extruded, rigid, impact-resistant plastic, minimum 0.110 inch (2.8 mm) thick, in profile indicated.
      a. Profile: nominal 8 inch (200 mm) high by 1 inch (25 mm) deep.
      b. Surface: Uniform.

c. Color and Texture: As selected by Architect from manufacturer's full range.

2. Retainer: Manufacturer's standard continuous, one-piece, extruded aluminum retainer, minimum 0.080 inch (2.03 mm) thick, with continuous rubber or vinyl bumper cushion centered in the extrusion.
   a. Mounting Type: Surface-mounted flush on wall.
3. Accessories: Provide prefabricated, injection-molded end caps and inside and outside corners with concealed splices, cushions, mounting hardware, and other accessories as required.
   a. End caps and inside and outside corners shall match plastic cover color and shall be field adjustable for close alignment with snap-on plastic covers.

2.5 CORNER GUARDS

A. Surface-Mounted, Resilient Plastic Corner Guards: Provide surface-mounted, resilient plastic corner guard assembly consisting of a snap-on-type plastic cover installed over a continuous aluminum retainer, including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition.
   1. Cover: Extruded rigid plastic, minimum 0.100-inch wall thickness; as follows:
      a. Profile: Nominal 3-inch-long leg and 1/4-inch corner radius.
      b. Height: 8 feet.
      c. Color and Texture: As selected by Architect from manufacturer's full range.
   2. Continuous Retainer: Minimum 0.060-inch-thick, one-piece, extruded aluminum.
   3. Top and Bottom Caps: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.

B. Stainless Steel Corner Guards: Provide stainless steel corner guards fabricated as one piece 0.059 inch (1.5 mm) thick minimum, with formed edges. Height as indicated.
   1. Provide 90-degree turn, unless otherwise indicated, and 1/8 inch corner radius.
   2. Wing Size: 2-1/2 x 2-1/2 inch (64 x 64 mm) wings, unless otherwise indicated.
   3. Finish: manufacturer's standard paper-covered satin finish.
   4. Mounting Method: Surface-mounted with factory-drilled mounting holes 8 inches (200 mm) on center and flat-head countersunk stainless steel screws

2.6 FABRICATION

A. General: Fabricate wall and door protection systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thicknesses of components.

B. Preassemble components in the shop to the greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

C. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of evidence of wrinkling, chipping, uneven coloration, dents, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

D. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors for interconnection of members to other construction.

E. Provide inserts and other anchorage devices for connecting components to concrete or masonry. Fabricate anchoring devices to be capable of withstanding-imposed loads. Coordinate anchoring devices with the supporting structure.

2.7 FINISHES

A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. General: Comply with NAAMM “Metal Finishes Manual” for recommendations relative to application and designations of finishes.

PART 3- EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine walls to which wall and door protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.

C. Complete all finishing operations, including painting, before beginning installation of wall surface protection system materials.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

E. Before installation, clean substrate to remove dust, debris, and loose particles.

3.2 INSTALLATION

A. Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions.
B. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

C. Provide anchoring devices and suitable locations to withstand imposed loads.

D. Install aluminum retainers, mounting brackets, and other accessories in strict accordance with the manufacturer’s instructions.
   1. Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.
   2. Where splices occur in horizontal runs of over 20 feet (6 m), splice aluminum retainer and

plastic cover at different locations along the run but no closer than 12 inches apart.

E. Adjust end and top caps as required to ensure tight seams.

3.3 CLEANING

A. Immediately upon completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent. Clean metal components in accordance with the manufacturer's recommendations.

B. Remove surplus materials, rubbish, and debris resulting from installation upon completion of work and leave areas of installation in neat, clean condition.

3.4 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

END OF SECTION 102600

SECTION 102800
TOILET ACCESSORIES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SUMMARY

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the toilet and bath accessories as shown on the drawings, specified herein, and required by the job conditions, including but not limited to, the following:
   1. Stainless steel toilet tissue dispensers.
   2. Stainless steel paper towel dispenser and waste receptacle.
   3. Stainless steel grab bars.
   4. Warm air dryers.
   5. Mirrors, including accessibility-compliant models.
   6. Soap dispensers.
   7. Under lavatory guards.
   8. Toilet paper dispenser with sanitary disposal.
   9. Shelf
   10. Door Hook
   11. Baby Changing Station

1.3 RELATED SECTIONS

A. Division 2 Section “Demolition and removal of selected portions of buildings and site elements.”

B. Division 9 Section “Tiling.”

C. Division 10 Section “Toilet Compartments.”

1.4 QUALITY ASSURANCE

A. Products: Unless otherwise noted, provide products of same manufacturer for each type of unit and for units exposed in same areas.

1.5 COORDINATION

A. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.

B. Accessory Locations: Coordinate accessory locations with other work to avoid interference and

to assure proper operation and servicing of accessory units.

C. Accessory Locations: Coordinate accessory locations to ensure required clearances for access by disabled persons and compliance with prevailing accessibility regulation.

D. Product data for each type of product specified. Submit manufacturer's technical data, catalogue cuts and installation instructions for each toilet accessory. Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory.

E. Submit schedule of accessories indicating quantity and location of each item.

F. Setting drawings: Verify dimensions and show location of accessories. Include plans, elevations, sections, details, templates, instructions, and directions for attachments to other work.

G. Samples for Initial Selection: Manufacturer’s color charts showing full range of colors, textures, and patterns available to each accessory: verify design operation and finish requirements.

H. Approved full-size samples will be returned and may be used in the Work.

I. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

1.6 SUBMITTALS

A. Product data for each type of product specified. Submit manufacturer's technical data, catalogue cuts and installation instructions for each toilet accessory. Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory.

B. Submit schedule of accessories indicating quantity and location of each item.

C. Setting drawings: Verify dimensions and show location of accessories. Include plans, elevations, sections, details, templates, instructions, and directions for attachments to other work.

D. Samples for Initial Selection: Manufacturer’s color charts showing full range of colors, textures and patterns available to each accessory: verify design operation and finish requirements.

E. Approved full-size samples will be returned and may be used in the Work.

F. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

1.7 PRODUCT HANDLING

A. Deliver accessories to the site ready for use in the manufacturer’s original and unopened containers and packaging, bearing labels as to type or material, manufacturer’s name and brand

name. Delivered materials shall be identical to approved samples.

1.8 GUARANTEES

A. General Guarantee: Special guarantee specified in this Article shall not deprive DCAS of other rights DCAS may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other guarantees made by Contractor under requirements of the Contract Documents.

B. Manufacturer's Mirror Guarantee: Written guarantee, executed by mirror manufacturer, agreeing to replace mirrors that develop visible silver spoilage defects within minimum guarantee period indicated.

C. The Guarantee Period is Five (5) years, and shall commence upon final acceptance of the Work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering accessories that may be incorporated into the Work include, but are not limited to, the following:
1. American Specialties, Inc.
2. Bobrick Washroom Equipment, Inc.
3. A & J Washroom Accessories, Inc.
4. Bradley Corporation.
5. General Accessory Manufacturing Co. (GAMCO).
6. McKinney/Parker Washroom Accessories Corp.
7. Excel Dryer Corporation.
8. Xlerator
9. Koala Kare
10. Or an Approved Equal.

2.2 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (Texture satin), in 0.0312-inch (0.8-mm) minimum nominal thickness, unless otherwise indicated.

B. Baked Enamel Finish: Factory-applied, gloss-white, baked acrylic-enamel coating.

C. Mirror Glass: ASTM C 1036, Type 1, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating and protective organic coating complying with FS DD-M-411. Thickness of glass will be historic 1/4 inch (6 MM).

D. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

E. Brass: ASTM B 19 flat products; ASTM B 16, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

2.3 FASTENING DEVICES

A. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

B. No exposed fastening devices permitted on exposed frames.

C. For metal stud drywall partitions, provide ten (10) gauge galvanized sheet concealed anchor plates for securing surface mounted accessories.

2.4 FABRICATION

A. General: Names or labels are not permitted on exposed faces of accessories. On interior surface not exposed to view or on back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.

B. Keys: Provide universal keys for internal access to accessories for servicing and re- supplying. Provide minimum of six keys to DCAS.

C. Surface Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.

D. Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless-steel hinge. Provide anchorage that is fully concealed when unit is closed.

E. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.

F. Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows: One-piece galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.

2.5 ACCESSORY SCHEDULE

A. Mirrors
   1. Adjustable Tilt Mirror type, frame 18-gauge stainless steel with corners welded and ground smooth. Tilts a full 6" (152mm), bottom mounted on full width stainless steel piano hinge. Size 48" x 36" (122 x 91cm).
   2. Channel Frame Mirror 1/2" x 1/2" x 1/2" (13 x 13 x 13mm) 20-gauge, satin finish stainless steel channel with mitered corner. Install on two wall brackets with theft- resistant screws.
   3. Stainless Steel Channel Frame Mirror with shelf, 1/2" x 1/2" x 1/2" (13 x 13 x 13mm) 18-gauge stainless steel shelf with satin finish.

B. Grab Bars:
   1. Snap Flange-Type, 1-1/4" (32 mm) o.d. or 1-1/2" (38mm) o.d. Concealed mounting flange 3-1/8" (79mm) o.d. diameter with two screw holes and three locking dimples, 1/8" (3mm) thick, type 304 stainless steel. Stainless steel cover with satin finish, 22 gauge, 3-3/16" (81 mm) diameter.
   2. Concealed Mounted: 1-1/4" (32mm) o.d. or 1-1/2" (38mm); flange 3" (76 mm) diameter, 1/2" (13mm) deep, 11-gauge step 304 stainless steel; tenon plate 13 gauge with slotted screw holes. Flange secured to concealed tenon plate with 3 stainless steel Allen head screws.
   3. Exposed Mounted: 1-1/4" (32mm) o.d. or 1-1/2" (38mm) o.d.; flange 3" (76mm) diameter; 1/8" (3mm) thick type 304 stainless steel with a satin finish. Exposed mounting screw holes are drilled and countersunk.

C. Roll Toilet Tissue and Paper Towel Dispenser and Waste Receptacle: Stainless steel; dispenses rolls 8" or 9" (205 or 230mm) wide, 800 ft. long in preset lengths, 2-1/2", 4" or 5" (65, 100, 125mm) per stroke. Removable 10-gallon (37.8L) waste container. Wall opening 14-1/2" x 39 5/8" x 9-1/8" (370 x 1000 x 240mm).

D. Surface Mounted Dual Roll Toilet Paper Dispenser: Overall size 6" x 12" x 6-1/2" (150 x300 x 165mm). Type 304 stainless steel cabinet and mechanism with theft- resistant spindles. Holds two rolls up to 5-1/4" (135mm) diameter (1800) sheets; top roll to automatically drop in place when bottom roll used up.

E. Soap Dispensers:
   1. Horizontal soap dispenser for liquid, lotion and detergent type soap. Capacity 48 fluid ounces (1.2L). Unbreakable refill window, concealed fastening and hinged filler-top for vandal resistance.
   2. Recessed soap dispenser for liquid, lotion and detergent type soap. Capacity 48 fluid ounces (1.2L). Unbreakable refill window, concealed fastening, vandal resistant.
   3. Stainless steel, lavatory mounted all-purpose soap dispenser, top filling with corrosion-resistant valve, vandal resistant with adjustable threaded shank allowing installation in countertops up to 3 1/2" (90mm) thick through 1/8" (22mm) diameter hole.

F. Warm Air Dryers (4" deep, ADA Compliant): Surface mounted one-piece stainless-steel cover. Stainless steel cover shall be 18 gauge (1.3mm) and shall have satin or bright finish. Dryer shall not protrude more than 4" (102mm) from the wall and shall comply with ADAAG requirements. The motor shall be a 1/4 HP 7500 RPM deal shaft brush type, with two blower housings, two fans, and two totally enclosed heating elements. The unit shall send 183 cubic feet per minute of warm air through two directional tamper- resistant air exits and be protected by automatic resetting thermal protection device. The unit shall have hands-free automatic stop/start infrared circuitry and self-adjusting timeout and fail safe "off protection." The entire unit shall be internally grounded and shall have universal voltage circuitry allowing it to operate at input voltages of 100 to 240 VAC-50/60 Hc. It shall be UL, CSA, EN, and CE listed.

G. Under lavatory Guards: Stainless steel, 18-gauge (1.3mm) pipe guards.

H. Baby Changing Station: Surface-mounted baby changing station body shall be injection-molded polypropylene finished with a 304 brushed stainless steel finish veneer on the front surface and

with antimicrobial embedded into plastic material on the changing surface. Unit shall be equipped with a pneumatic cylinder for controlled opening and closing of bed. Bed shall be secured to metal mounting chassis with a concealed steel-on-steel hinge. Unit shall conform to ASTM F 2285-04 Standard Safety Performance Specification for Diaper Changing Tables for Commercial Use, ANSI Z535.4 Product Safety Signs and Labels, EN 12221:2008, ASTM G22 Antibacterial standards.

I. Hat and Coat Rack Hook

J. Mop and Broom Holder
K. Shower Curtain Rod

L. Shower Curtain Hook and Curtain

M. Soap Dish

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where toilet accessories are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 PREPARATION

A. Accessories which are to be partition mounted shall be closely coordinated with other trades, so that the necessary reinforcing is provided to receive the accessories.

B. Furnish templates and setting drawings and anchor plates required for the proper installation of the accessories at gypsum drywall and masonry partitions. Coordinate the work to assure that base plates and anchoring frames are in the proper position to secure the accessories.

C. Verify by measurements taken at the job site those dimensions affecting the work. Bring field dimensions which are at variance with those on the approved shop drawings to the attention of the Architect. Obtain decision regarding corrective measures before the start of fabrication of items affected.

D. Cooperate in the coordination and scheduling of the work of this Section with the work of other Sections so as not to delay job progress.

3.3 INSTALLATION

A. Install accessories at locations indicated on the drawings, using skilled mechanics, in a plumb, level, and secure manner.

B. Install accessories according to manufacturer's written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer.

C. Concealed anchor assemblies for gypsum drywall partitions shall be securely anchored to metal studs to accommodate accessories. Assemblies shall consist of plates and/ or angles tack welded to studs.

D. Secure accessories in place, at their designated locations by means of theftproof concealed set screws, to render removing of the accessory with a screwdriver impossible.

E. Unless otherwise indicated, accessories shall conform to heights from the finished floor as shown on the drawings. Where locations are not indicated, such locations shall be as directed by the Architect.

F. Installed accessories shall operate quietly and smoothly for use intended. Doors and operating hardware shall function without binding or unnecessary friction. Dispenser type accessories shall be keyed alike. Prior to final acceptance, master key and one duplicate key shall be given to Owner's authorized agent.

G. Grab bars shall be installed so that they can support a three hundred (300) lb. load for five minutes per ASTM F446.

H. The Architect shall be the sole judge of workmanship. Workmanship shall be of the highest quality. Open joints, weld marks, poor connections, etc., will not be permitted. The Architect has the right to reject any accessory if he feels the workmanship is below the standards of this project.

I. The Contractor is responsible to cut and fit, accurately, and neatly, all devices and anchoring components. The contractor shall repair all damage, caused by his installation to adjacent surfaces or during his installation damage the work of other contractors at no additional cost to the City of New York.

3.4 ADJUSTING AND CLEANING

A. Upon completion of the installation, clean accessories of dirt, paint and foreign matter.

B. Adjust accessories for unencumbered, smooth operation and verify that mechanisms are functioning properly. Replace damaged or defective items.

C. Remove temporary labels and protective coatings.

D. Upon completion of the Work, the Contractor shall thoroughly clean and polish exposed surfaces according to manufacturer's written recommendations.

E. During the installation of accessories and until finally installed and accepted, protect accessories with gummed canvas or other means in order to maintain the accessories in acceptable condition.

F. Replace and/ or repair installed work which is damaged or defective to the Owner's satisfaction, at no additional cost.

3.5 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

B. DCAS reserves the right to provide materials for installation purposes only.

END OF SECTION 102800

SECTION 104413
FIRE EXTINGUISHERS AND CABINETS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. The Work of this Section includes all labor, materials, equipment and services necessary to complete the fire extinguishers and cabinets as shown on the drawings and/ or specified herein.

1.3 RELATED SECTIONS

A. Gypsum drywall- Section 092900.

1.4 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain fire extinguisher cabinets from one source from a single manufacturer.

B. UL-Listed Products: Provide new portable fire extinguishers which are UL-listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher indicated.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each type of product specified. For fire extinguisher cabinets include roughing-in dimensions and details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, and panel style and materials. Where color selections by Architect are required, include color charts showing full range of manufacturer's standard colors and designs available.

B. Samples: Submit samples, 6" square, of each required finish on metal of same gage as used for production. Where normal color variations are to be expected, include 2 or more units in each sample set showing limits of variation.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include but are not limited to the following:
   1. Croker.
   2. Allenco
   3. Larsen's Manufacturing Co.
   4. Potter-Roemer, Inc.
   5. J.L. Industries.
   6. Or an Approved Equal.

B. Products: Subject to compliance with requirements, provide 2600 Series- Model #2606 fire extinguisher cabinets as manufactured by Croker, or approved equal by specified manufacturers.

2.2 FIRE EXTINGUISHER CABINETS

A. General: Provide fire extinguisher cabinets where indicated, of suitable size for housing fire extinguishers of types and capacities indicated.

B. Construction: Manufacturer's standard enameled steel box, with trim, frame, door and hardware to suit cabinet type, trim style, and door style indicated. Weld all joints and grind smooth. Miter and weld door frames.

C. Cabinet Type: Suitable for mounting conditions indicated, of the following types:
   1. Trimless Cabinet Type: Cabinet box recessed in walls of sufficient depth to suit style, for trimless installation.

D. Trim Style: Fabricate trim in one piece with corners mitered, welded, and ground smooth.
   1. Trimless: Surface of surrounding wall finishes flush with exterior finished surface of frame and door of fire extinguisher cabinet, without any overlapping trim attached to cabinet.
   2. Trimless with hidden flange of same metal and finish as box that overlaps surrounding wall finish and is concealed from view by an overlapping door.

E. Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.
   1. Stainless Steel: Manufacturer's standard door construction, fabricated from austenitic stainless steel type 304 with No. 4 finish complying with ASTM A 167, and clear bubble insert.

F. Door Style: Manufacturer's standard design as indicated below, or equal from approved manufacturer.
   1. Break Bubble: Clear bubble with stainless steel trim.

G. Door Hardware: Provide manufacturer's standard door operating hardware of proper type for cabinet and door indicated. Provide friction latch and continuous hinge permitting door to open 180 degrees.

2.3 FACTORY FINISH

A. General: Factory finish fire extinguisher cabinets to comply with NAAMM “Metal Finishes Manual” after products are assembled. Protect cabinets with plastic or paper covering, prior to shipment.
B. Stainless Steel Finish: AISI No. 4 finish, bright, directional polish finish

2.4 EXTINGUISHERS

A. General: Provide fire extinguishers for each extinguisher cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard which comply with requirements of governing authorities.
   1. Fill and service extinguishers to comply with requirements of governing authorities and manufacturer.

B. Abbreviations indicated below to identify extinguisher type related to UL classification and rating system and not necessarily to type and amount of extinguishing material contained in extinguisher.

C. Multi-Purpose Dry Chemical Type: UL rated 2A-10B:C, 5 lb. nominal capacity, in enameled steel container, for Class A, Class B and Class C fires.

2.5 MOUNTING BRACKETS

A. Provide manufacturer's standard bracket designed to prevent accidental dislodgment of extinguisher, of proper size for type and capacity of extinguisher specified, in manufacturer's standard enamel finish; color to match extinguisher.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where fire extinguishers and cabinets are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Report to DCAS in writing any unsatisfactory conditions and do not proceed with installation until such conditions have been corrected.

3.2 INSTALLATION

A. Install items included in this Section in locations indicated and at heights to comply with applicable regulations of governing authorities.
   1. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
   2. “Trimless” fire extinguisher cabinets must be installed before drywall is installed.
   3. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square

and plumb, to comply with manufacturer's instructions.

4. Clean all exposed surfaces and repair any damage to products or finish to match original or replace.

B. Where exact location of cabinets and bracket-mounted fire extinguishers is not indicated, locate as directed by the Architect.

3.3 IDENTIFICATION

A. Identify fire extinguisher in cabinet with lettering spelling "FIRE EXTINGUISHER" painted on door by silk-screen process or die cut lettering. Provide lettering on door as selected by Architect from manufacturer's standard letter sizes, styles, colors and layouts.

B. Identify bracket-mounted extinguishers with red letter decals spelling 'FIRE EXTINGUISHER' applied to wall surface. Letter size, style and location as selected by the Architect.

3.4 SERVICE

A. Determine the approximate completion date of the work and then inspect, charge, and tag the fire extinguishers at a date not more than 10 days before or not less than one day before actual completion date of the work.

3.5 MEAUSREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

END OF SECTION 104413

SECTION 122113
HORIZONTAL LOUVER BLINDS AND SHADES

PART 1- GENERAL

1.1 SUMMARY

A. The Work of this Section includes the furnishing of all labor and materials for the installation of aluminum slat venetian blinds.

B. Section Includes:
   1. Horizontal louver blinds with aluminum slats.
   2. The Contractor shall measure the windows for which blinds are requested and shall be solely responsible for any and all measurements.
      a. Windows having window air conditioning units or within soffits shall be covered and must be a part of the overall dimension.

1.2 RELATED SECTIONS:

A. Division 6 Section "Carpentry" for wood blocking and grounds for mounting horizontal louver blinds and accessories.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's catalog cuts, specifications, and instructions for installation of the product specified.

B. Shop Drawings: Installation details.

C. Samples for Initial Selection: For each type and color of horizontal louver blind. Include Samples of accessories involving color selection.

D. Samples for Verification: For each type and color of horizontal louver blind indicated.
   1. Slat: Not less than 12 inches long.
   2. Tapes: Full width, not less than 6 inches long.
   3. Horizontal Louver Blind: Full-size unit, not less than 16 inches wide by 24 inches long.
   4. Valance: Full-size unit, not less than 12 inches wide.

E. Product Schedule: Use same designations indicated on Drawings.

F. Product Test Reports: For horizontal louver blinds with polymer slats that have been tested for compliance with NFPA 701.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data, to include in maintenance manuals.

1.5 EXTRA MATERIALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Provide full-size units equal to 5 percent of quantity installed for each size, color, texture, pattern, and gloss indicated, but no fewer than two.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain horizontal louver blinds from single source from single manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
   1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall have blinds delivered and installed within 45 calendar days of order date by DCAS.

B. Deliver horizontal louver blinds in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet-work and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2- PRODUCTS

2.1 MANUFACTURERS

A. The Contractor shall furnish 1” (one-inch) aluminum slat horizontal louver blinds by “Riviera Blinds” manufactured by
   1. Levolor
   2. Hunter Douglas

3. Springs Window Fashions
4. Or an Approved Equal.

2.2 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS

A. Blinds shall be complete with new brackets, center supports, tilt gear and automatic cord lock.

B. Colors, Textures, Patterns, and Gloss:
   1. Slats: As selected by Architect from manufacturer's full range.
   2. Components: Provide rails, cords, ladders, and materials exposed to view matching or coordinating with slat color unless otherwise indicated.

C. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radius corners.
   1. Width: 1 inch.
   2. Thickness: Manufacturer's standard.
   3. Spacing: Manufacturer's standard.

D. Headrail: Formed steel or extruded aluminum; long edges returned or rolled and capped or plugged ends. Headrails fully enclose operating mechanisms on three sides.
   1. Capacity: Pair adjacent blinds on a single headrail, unless otherwise indicated.

E. Bottom Rail: Formed-steel or extruded-aluminum tube that secures and protects ends of ladders and lift cords and has plastic- or metal-capped ends.

F. Ladders: Braided cord, evenly spaced across headrail at spacing that prevents long-term slat sag.

G. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
   1. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by blind manufacturer for weight and size of blind.

H. Operators:
   1. Manual Lift Mechanism:
      a. Manufacturer's standard braided cord.
      b. Lift-Cord Lock: Variable; stops lift cord at user-selected position within blind full operating range.
   2. Manual Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
      a. Tilt: Full.
      b. Operator: Clear-plastic wand.
      c. Over-Rotation Protection: Manufacturer's detachable operator or slip clutch to prevent over rotation of gear.
   3. Manual Lift-Operator and Tilt-Operator Lengths: Length required to extend to 48 inches above floor level when blind is fully closed.

2.3 HORIZONTAL LOUVER BLIND FABRICATION

A. Product Safety Standard: Fabricate horizontal louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
   1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which blind is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill dimension of opening in which blind is installed less 1/4 inch, plus or minus 1/8 inch.
      Outside of Jamb Installation: Width and length as indicated, with terminations between blinds of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
   1. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.

D. Mounting and Intermediate Brackets: Designed for removal and reinstallation of blind without damaging blind and adjacent surfaces, for supporting blind components, and for bracket positions and blind placement indicated.

E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to brackets and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.

F. Color-Coated Finish:
   1. Metal: For components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

PART 3- EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. The Contractor shall remove the existing shade(s) or blinds (including hardware) from the window.
   1. The Contractor will be responsible for patching and painting surfaces where existing

blinds have been removed.

2. The Contractor shall appropriately discard the removed blinds or shades.

3.3 INSTALLATION

A. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.
   1. Locate so exterior slat edges are not closer than 1/2 inch from interior faces of glazing frames through full operating ranges of blinds.
   2. Install mounting and intermediate brackets to prevent deflection of headrails.
   3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.

B. New brackets shall be installed regardless or existing hardware at the window. There shall be a center support for windows 36 inches wide or greater with an additional support for every 24 inch increment above the 36 inches.

3.4 ADJUSTING

A. Adjust horizontal louver blinds to operate free of binding or malfunction through full operating ranges.

3.5 CLEANING AND PROTECTION

A. Clean horizontal louver blind surfaces after installation according to manufacturer's written instructions.

B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer that ensures that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.

C. Replace damaged horizontal louver blinds that cannot be repaired in a manner approved by Architect before time of Substantial Completion.

3.6 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

B. DCAS reserves the right to provide materials for installation purposes.

END OF SECTION 122113

SECTION 122413
INTERIOR SHADES

PART 1- GENERAL

1.1 GENERAL REQUIREMENTS

A. Work in this section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SUMMARY

A. Work of this section includes all labor, materials, equipment and services necessary to complete the window shades as shown on the drawings and / or specified herein including, but not limited to, the following:
   1. Motorized interior roller shades.
   2. While fulfilling the scope of work, it shall be the responsibility of the contractor to coordinate with other trades.

1.3 RELATED SECTIONS

A. Section 06100- Rough Carpentry: Wood blocking and grounds for mounting roller shades and accessories

B. Section 095113- Acoustical Panel Ceilings: Coordination with acoustical ceiling systems for installation of shade pockets, closures and related accessories.

1.4 REFERENCES

A. ASTM G 21- Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. NFPA 70- National Electrical Code.

C. NFPA 701- Fire Tests for Flame-Resistant Textiles and Films

1.5 SUBMITTALS

A. Product data: For each type of product indicate provide information relating to styles, material descriptions, construction, details, dimensions of individual components and profiles, features, finishes and operating instructions.
   1. Motorized shade operators: include operating instructions.
   2. Motors: show nameplate data, ratings, characteristics, and mounting arrangements
   3. Preparation instructions and recommendations.
   4. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.

5. Storage and handling requirements and recommendations.
6. Mounting details and installation methods.
7. Typical wiring diagrams including integration of motor controllers with building management system, audiovisual and lighting control systems as applicable.

B. Provide detailed functional hierarchy and sequence of operation, where items maybe motorized.

C. Shop drawings: Submit fully detailed drawings prepared in AutoCAD format showing-floor layout and elevations indicating the location of all the shading systems, details of systems and all components, finishes and perimeter construction conditions, installation, wiring and controls, and all applicable dimensions.

D. Samples: Submit full size samples of each shade (including by not limited to Fabric, mounting, motorization, and guides type for architect's acceptance.

E. Mockup:
   a) Install each type of shade assembly in one conference room bay for architect's acceptance of installation details, workmanship, and operation, including building scale control system with its related functions.
   b) Approved mockup shall be used as the standard for installation work under this section and no further installation work shall proceed before architect's acceptance of the mockup.

F. The mockup shades shall form part of the finished works, if deemed acceptable by design and owner's team.
   1. Mockup:
      a. Install each type of shade assembly in one conference room bay for architect's acceptance of installation details, workmanship, and operation, including building scale control system with its related functions.
      b. Approved mockup shall be used as the standard for installation work under this section and no further installation work shall proceed before architect's acceptance of the mockup.
      c. The mockup shades shall form part of the finished works, if deemed acceptable by design and owner's team.

1.6 QUALITY ASSURANCE

A. All bidders submitting bids on the work of this section shall meet or exceed the quality of materials, components and assemblies specified herein Bidders who do not comply with these performance specifications shall refrain from submitting a bid.

B. All work specified under this section supplied and installed entirely by one Subcontractor using his own forces.

C. Conform to applicable New York State Building Code and Local Authority having jurisdiction and all other standards noted.

D. Install one complete operating sample with accessories on site. Review the installation for design and owner's team approval before proceeding with the remainder of the work. Adjust sample installation to gain acceptance. Accepted work may form part of the final installation, if deemed acceptable by design and owner's team.

E. Manufacturer shall have a minimum of fifteen (15) years' experience in the manufacture of specified shading system.

F. Shades to be installed by a firm, with a minimum of ten (10) years' experience, specializing in the installation of shading systems.

1.7 INSPECTION / PREPARATION

A. Verify that all blocking and framing necessary to carry shade assembly hardware is properly installed and secure.

B. Notify Owner in writing of any deficiencies in the work of other trades that would affect the window treatment system.

C. Make accurate measurements at the site before fabrication. Check layout of glazing framing sections, spans, and loading capabilities.

1.8 DELIVERY STORAGE AND HANDLING

A. Do not deliver to site until areas to receive shades are completely finished, all walls and ceilings completed and painted.

B. Deliver materials in original protective wrappings or containers, with manufacturers labels and sealed intact.

C. Handle and store materials according to manufacturer's recommendations protecting materials and finishes from damages, marring of finishes or soiling.

1.9 WARRANTY

A. Provide a limited manufacturers warrantee from the Date of Substantial Completion, covering the following:
   1. Shade Hardware including electric motors: Ten (10) Years
   2. Electronic Control Equipment: Ten (10) Years
   3. Fabrics / Shade Cloth: Ten (10) Years
   4. Aluminum and steel coatings: Ten (10) Years

B. Provide a limited installation warranty from Date of Substantial Completion, covering a period of one (1) year.

C. Submit standard manufacturers maintenance contract for review by Owner.

PART 2 – PRODUCTS

***Note: Please refer to the diagrams indicating the base design and add alternates for shade configuration.*

2.1 MANUFACTURERS

A. Acceptable Manufacturer: MechoShade Systems, Inc., which is located at: 42-03 St.; Long Island City, NY 11101; Tel: 718-729-2020; Fax: 718-729-2941.
Email: angela.gratereaux@mechoshade.com; Web:www.mechoshade.com

B. Or an Approved Equal approved by DCAS Architect or Engineer.

2.2 ROLLER SHADE TYPE AND SHADECLOTH

A. Motorized Shades:
   a. Mounting: Surface mounted with pocket.

B. Configuration: Single solar shade cloth.

C. Solar Shade cloth
   1. Fabric: ThermoVeil 0900, 0-1 percent visually translucent extra-dense linear weave pattern.
   2. Color: Selected from manufacturer's standard colors

2.3 SHADE BAND

A. Shade Bands: Construction of shade band includes the fabric, the hem weight, hem-pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.
   1. Hem Pockets and Hem Weights: Fabric hem pocket with RF-welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be similar, for all shades within one room.
   2. Shade Band and Shade Roller Attachment.
      a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection. Roller tubes less than 1.55 inch (39.37 mm) in diameter for manual shades, and less than
      b. 2.55 inches (64.77 mm) for motorize shades are not acceptable.
      c. Provide for positive mechanical engagement with drive / brake mechanism.
      d. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" "snap- off" spline mounting, without having to remove shade roller from shade brackets.
      e. Mounting spline shall not require use of adhesives, adhesive tapes, staples, and/ or rivets.
      f. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/ or rivets are not acceptable.

2.4 SHADE FABRICATION

A. Fabricate units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise.

B. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shade bands. Contractor shall be responsible for assuring the width-to- height (W:H) ratios shall not exceed manufacturer's standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shade cloth within specified standards. Battens shall be roll- formed stainless steel or tempered steel, as required.

C. For railroaded shade bands, provide seams in railroaded multi-width shade bands as required to meet size requirements and in accordance with seam alignment as acceptable to Architect. Seams shall be properly located. Furnish battens in place of plain seams when the width, height, or weight of the shade exceeds manufacturer's standards. In absence of such standards, assure proper use of seams or battens as required to, and assure the proper tracking of the railroaded multi-width shade bands.

D. Provide battens for railroaded shades when width-to-height (W:H) ratios meet or exceed manufacturer's standards. In absence of manufacturer's standards, be responsible for proper use and placement of battens to assure proper tracking and roll of shade bands.

2.5 COMPONENTS

A. Access and Material Requirements
   1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
   2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
   3. Use only Delrin engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced polyester will not be acceptable.

B. Motorized Shade Hardware and Shade Brackets
   1. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel, or heavier, thicker, as required to support 150 percent of the full weight of each shade.
   2. Provide shade hardware system that allows for field adjustment of motor or replacement of any operable hardware component without requiring removal of brackets, regardless of mounting position (inside, or outside mount).
   3. Provide shade hardware system that allows for operation of multiple shade bands offset by a maximum of 8-45 degrees from the motor axis between shade bands (4-22.5 degrees) on each side of the radial line, by a single shade motor (multi-banded shade, subject to manufacturer's design criteria)

2.6 SHADE MOTOR DRIVE SYSTEM

A. Shade Motors:
   1. Tubular, asynchronous (non-synchronous) motors, with built-in reversible capacitor operating at 110v AC (60hz), single phase, temperature Class A, thermally protected, totally enclosed, maintenance free with line voltage power supply equipped with locking disconnect plug assembly furnished with each motor.
   2. Conceal motors inside shade roller tube.
   3. Maximum current draw for each shade motor of 2.3 amps.
   4. Use motors rated at the same nominal speed for all shades in the same room

B. Total hanging weight of shade band shall not exceed 80 percent of the rated lifting capacity of the shade motor and tube assembly.

2.7 ACCESSORIES

A. Roller Shade Pocket: For recessed mounting in acoustical tile, or drywall ceilings as indicated on the Drawings.
   1. Provide either extruded aluminum and or formed steel shade pocket, sized to accommodate roller shades, with exposed extruded aluminum closure mount, tile support and removable closure panel to provide access to shades.

B. Pocket Accessories: As indicated on the Drawings.

PART 3- EXECUTION

3.1 FABRICATION

A. Shading system components manufactured and assembled allowing for installation techniques to suit project requirements.

B. Finished assemblies shall be, square, true to size and free from distortion, twist, or other defects that could affect their strength, operation, or appearance. Factory applied finish shall be uniform, smooth and without blemishes.

C. The fabric shall be colourfast, retain its shape, not be affected by moisture or heat, and shall be non-flammable. Cut fabric to eliminate glare and reflection from shining surfaces while maintaining exterior view. The top of the fabric is retained in recessed spline of the shade roller and the bottom of the fabric is retained by the selected hem bar.

D. Coordinate location of battens and bands / welding of fabric material together with the architect.

3.2 INSTALLATION

A. Install work by manufacturer’s skilled tradesmen and installed in strict accordance with manufacturers recommendations.

B. All items installed, plumbed, squared, rigidly coupled and adequately anchored,

maintaining uniformed clearances, accurate alignment levels, and parallel with the window plane. Fabric shall not travel more than 3 mm (0.125") in either direction within channels after installation.

C. The solar screen and / or blackout fabric shall be pre-measured and manufactured off-site.

D. The contractor shall be responsible to coordinate the installation of all control equipment within the available space in electrical rooms.

3.3 ADJUSTING AND CLEANING

A. Adjust shades and operating components as required to ensure smooth and trouble-free operation without binding.

B. Adjust shade and shade-cloth to hang flat without buckling or distortion.

C. Clean shades and exposed components.

D. Replace work, which cannot be satisfactorily repaired, adjusted, or cleaned.

E. Coordinate with Commissioning Contractor to fine tune control function hierarchy set-points and control detection method.

F. The contractor shall review the schedule of operations with the owner during commissioning.

3.4 COMMISSIONING

A. The shade control system will be commissioned on a floor-by-floor basis and then finally as an entire system. Final commissioning shall be successfully completed prior to the first move-in date for the occupants.

B. Final Acceptance of the shade control system shall be contingent upon successful commissioning of each floor and the entire system.

C. Final Acceptance shall be upon successful demonstration of all commissioning requirements described in section 3.3.C of these specifications.

D. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

E. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

F. Engage installer to train owner’s maintenance personnel to adjust, operate and maintain roller shade systems.

3.5 BREAK-IN PERIOD

A. The Break-in period shall take place for a minimum but not limited to twelve months from the initial system commissioning.

3.6 TECHNICAL SUPPORTS

A. Provide up to two training sessions for building maintenance personnel at substantial completion on critical maintenance issues and controls.

B. Provide option for on-site review with Owner's Representative for up to 3 years, with a bi-annual site visits at a minimum.

END OF SECTION 122413

SECTION 312000
EARTH MOVING

PART 1- GENERAL

1.1 SUMMARY

A. Section Includes:
1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants as shown on the plans.
3. Excavating and backfilling for buildings and structures.
4. Drainage course for concrete slabs-on-grade.
5. Subbase course for concrete walks, or pavements as shown on the plans.
6. Subbase course and base course for asphalt paving.
7. Subsurface drainage backfills for walls and trenches.
8. Excavating and backfilling trenches for utilities and pits for buried utility structures.
9. Excavating well hole to accommodate elevator-cylinder assembly.

B. Related Requirements:
1. Section 033000 "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
2. Section 315000 "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.

1.2 UNIT PRICES

A. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following. Unit prices for rock excavation include replacement with approved materials.
1. 24 inches (600 mm) outside of concrete forms other than at footings.
2. 12 inches (300 mm) outside of concrete forms at footings.
3. 6 inches (150 mm) outside of minimum required dimensions of concrete cast against grade.
4. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
5. 6 inches (150 mm) beneath bottom of concrete slabs-on-grade.
6. 6 inches (150 mm) beneath pipe in trenches, and the greater of 24 inches (600 mm) wider than pipe or 42 inches (1065 mm) wide.

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
   1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
   2. Bulk Excavation: Excavation more than 10 feet (3 m) in width and more than [30 feet (9 m) in length.
   3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. (0.76 cu. m) for bulk excavation or 3/4 cu. yd. (0.57 cu. m) for footing, trench, and pit excavation that cannot be removed by rock-excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
   1. Equipment for Footing, Trench, and Pit Excavation: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- (1065-mm-) maximum-width, short-tip-radius rock bucket; rated at not less than 138-hp (103-kW) flywheel power with bucket-curling force of not less than 28,700 lbf (128 kN) and stick-crowd force of not less than 18,400 lbf (82 kN) with extra-long reach boom.
   2. Equipment for Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp (172-kW) flywheel power and developing a minimum of 47,992-lbf (213.3-kN) breakout force with a general-purpose bare bucket.

I. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. (0.57 cu. m) or more in volume that exceed a standard penetration resistance of 100 blows/2 inches (97 blows/50 mm) when tested by a geotechnical testing agency, according to ASTM D 1586.

J. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

K. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

L. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

M. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference:

B. Retain subparagraph below if additional requirements are necessary; include information about conference.
   1. Review methods and procedures related to earthmoving, including, but not limited to, the following:
      a. Personnel and equipment needed to make progress and avoid delays.
      b. Coordination of Work with utility locator service.
      c. Coordination of Work and equipment movement with the locations of tree- and plant-protection zones.
      d. Extent of trenching by hand or with air spade.
      e. Field quality control.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:
   1. Geotextiles.
   2. Controlled low-strength material, including design mixture.
   3. Geofoam.
   4. Warning tapes.

B. Samples for Verification: For the following products, in sizes indicated below:
   1. Geotextile: 12 by 12 inches (300 by 300 mm).
   2. Warning Tape: 12 inches (300 mm) long; of each color.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and/ or borrow soil material proposed for fill and backfill as follows:
   1. Classification according to ASTM D 2487.
   2. Laboratory compaction curve according to ASTM D 698 ASTM D 1557.

C. Blasting plan approved by authorities having jurisdiction.

D. Seismic survey report from seismic survey agency.

E. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by

earth-moving operations. Submit before earth moving begins.

1.7 QUALITY ASSURANCE

A. Blasting: Comply with applicable requirements in NFPA 495, "Explosive Materials Code," and prepare a blasting plan reporting the following:
   1. Types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
   2. Seismographic monitoring during blasting operations.

B. Seismic Survey Agency: An independent testing agency, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:

   1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
   2. Seismographic monitoring during blasting operations.

C. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

1.8 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
   1. Do not proceed with work on adjoining property until directed by Architect.

C. Utility Locator Service: "One Call" for area where Project is located before beginning earth-moving operations.

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D. The following practices are prohibited within protection zones:
   1. Storage of construction materials, debris, or excavated material.
   2. Parking vehicles or equipment.
   3. Foot traffic.
   4. Erection of sheds or structures.
   5. Impoundment of water.
   6. Excavation or other digging unless otherwise indicated.

7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

E. Do not direct vehicle or equipment exhaust towards protection zones.

F. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2- PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487 or Groups A-1, A-2-4, A-2-5, and A-3 according to AASHTO M 145, or a combination of these groups; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
1. Liquid Limit: 3.5 ounces or smaller
2. Plasticity Index: >15

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487 or Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145, or a combination of these groups.
1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 294/D 2940M 0; with at least 95 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

H. Drainage Course: Narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and zero to 5 percent passing a No. 8 (2.36-mm) sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and

natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch (25-mm) sieve and zero to 5 percent passing a No. 4 (4.75-mm) sieve.

J. Sand: ASTM C 33/C 33M; fine aggregate.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
   1. Survivability: Class 2; AASHTO M 288.
   2. Survivability: As follows:
      a. Grab Tensile Strength: 157 lbf (700 N); ASTM D 4632.
      b. Sewn Seam Strength: 142 lbf (630 N); ASTM D 4632.
      c. Tear Strength: 56 lbf (250 N); ASTM D 4533.
      d. Puncture Strength: 56 lbf (250 N); ASTM D 4833.
   3. Apparent Opening Size: As shown on the plans sieve, maximum; ASTM D 4751.
   4. Permittivity: As shown on the plans per second, minimum; ASTM D 4491.
   5. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
   1. Survivability: Class 2; AASHTO M 288.
   2. Survivability: As follows:
      a. Grab Tensile Strength: 247 lbf (1100 N); ASTM D 4632.
      b. Sewn Seam Strength: 222 lbf (990 N); ASTM D 4632.
      c. Tear Strength: 90 lbf (400 N); ASTM D 4533.
      d. Puncture Strength: 90 lbf (400 N); ASTM D 4833.
   3. Apparent Opening Size: No. 60 (0.250-mm) sieve, maximum; ASTM D 4751.
   4. Permittivity: 0.02 per second, minimum; ASTM D 4491.
   5. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Self-compacting [low-density], flowable concrete material produced from the following:
   1. Portland Cement: ASTM C 150/C 150M, Type as shown on the plans
   2. Fly Ash: ASTM C 618, Class C or F.
   3. Normal-Weight Aggregate: ASTM C 33/C 33M, nominal maximum aggregate size as shown on the plans.
   4. Foaming Agent: ASTM C 869/C 869M.
   5. Water: ASTM C 94/C 94M.
   6. Air-Entraining Admixture: ASTM C 260/C 260M.

B. Produce low-density, controlled low-strength material with the following physical properties:
   1. As-Cast Unit Weight: unit weight range as shown on the plans at point of placement, when tested according to ASTM C 138/C 138M.
   2. Compressive Strength: As shown on the plans, when tested accordingto ASTM C 495/C 495M.

C. Produce conventional-weight, controlled low-strength material compressive strength when tested according to ASTM C 495/C 495M as shown on the plans.

2.4 GEOFOAM

A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type, density and compressive strength as shown on the plans.

B. Molded-Polystyrene Board Insulation: ASTM C 578, Type, density and compressive strength as shown on the plans.

C. Manufacture molded polystyrene with an inorganic mineral registered with the EPA and suitable for application as a termite deterrent.Rigid Cellular Polystyrene Geofoam: ASTM D 6817, Type, density and compressive strength as shown on the plans.

D. Connectors: As shown on the plans

2.5 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility; colored as follows:
   1. Red: Electric.
   2. Yellow: Gas, oil, steam, and dangerous materials.
   3. Orange: Telephone and other communications.
   4. Blue: Water systems.
   5. Green: Sewer systems.

B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:
   1. Red: Electric.
   2. Yellow: Gas, oil, steam, and dangerous materials.
   3. Orange: Telephone and other communications.
   4. Blue: Water systems.
   5. Green: Sewer systems.

PART 3- EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
   1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXPLOSIVES

A. Explosives: Do not use explosives.

B. Explosives: Obtain written permission from authorities having jurisdiction before bringing explosives to Project site or using explosives on Project site.
   1. Perform blasting without damaging adjacent structures, property, or site improvements.
   2. Perform blasting without weakening the bearing capacity of rock subgrade and with the least-practicable disturbance to rock to remain.

3.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
   1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
   2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
      a. 24 inches (600 mm) outside of concrete forms other than at footings.
      b. 12 inches (300 mm) outside of concrete forms at footings.
      c. 6 inches (150 mm) outside of minimum required dimensions of concrete cast against grade.
      d. Outside dimensions of concrete walls indicated to be cast against rock without forms

or exterior waterproofing treatments.
e. 6 inches (150 mm) beneath bottom of concrete slabs-on-grade.
f. 6 inches (150 mm) beneath pipe in trenches and the greater of 24 inches (600 mm) wider than pipe or 42 inches (1065 mm) wide.

B. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Architect. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.
1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; and soil, boulders, and other materials not classified as rock or unauthorized excavation.
a. Intermittent drilling: blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.
2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:
a. 24 inches (600 mm) outside of concrete forms other than at footings.
b. 12 inches (300 mm) outside of concrete forms at footings.
c. 6 inches (150 mm) outside of minimum required dimensions of concrete cast against grade.
d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
e. 6 inches (150 mm) beneath bottom of concrete slabs-on-grade.
f. 6 inches (150 mm) beneath pipe in trenches and the greater of 24 inches (600 mm) wider than pipe or [42 inches (1065 mm) wide.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Pile Foundations: Stop excavations 6 to 12 inches (150 to 300 mm) above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:
1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.
1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit unless otherwise indicated.
1. Clearance: 12 inches (300 mm each side of pipe or conduit or as indicated on the plans.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
4. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trench Bottoms: Excavate trenches 4 inches (100 mm) deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
1. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

E. Trenches in Tree- and Plant-Protection Zones:
1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.8 EXCAVATION FOR ELEVATOR CYLINDER

A. Drill well hole plumb in elevator pit to accommodate installation of elevator-cylinder assembly. Coordinate with applicable requirements for diameter and tolerances.
B. Provide well casing as necessary to retain walls of well hole.

3.9 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes) as indicated on the plans to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
   1. Completely proof-roll subgrade in one direction**,** repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
   2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.10 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi (17.2 MPa), may be used when approved by Architect.
   1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.11 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
   1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.12 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:
   1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
   2. Surveying locations of underground utilities for Record Documents.
   3. Testing and inspecting underground utilities.
   4. Removing concrete formwork.
   5. Removing trash and debris.
   6. Removing temporary shoring, bracing, and sheeting.
   7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.13 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within limits shown on the plans of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 "Cast-in-Place Concrete." or Section 033053 "Miscellaneous Cast-in-Place Concrete."

D. Trenches under Roadways: Provide a concrete-base slab support for piping or conduit less than 30 inches (750 mm) below surface of roadways as shown on the plans. After installing and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete before backfilling or placing roadway subbase course. Concrete is specified in Section 033000 "Cast-in-Place Concrete."

E. Backfill voids with satisfactory soil while removing shoring and bracing.

F. Initial Backfill:
   1. Soil Backfill: Place and compact initial backfill material shown on the plans, free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the pipe or conduit.
      a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
   2. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches (300 mm) over the pipe or conduit. Coordinate backfilling with utilities testing.

G. Final Backfill:
   1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
   2. Controlled Low-Strength Material: Place final backfill of controlled low-strength material

to final subgrade elevation.

H. Warning Tape: Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.14 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:
1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.15 GEOFOAM FILL

A. Place a leveling course of sand, 2 inches (50 mm) thick, over subgrade. Finish leveling course to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.
1. Place leveling course on subgrades free of mud, frost, snow, or ice.

B. Install geofoam blocks in layers with abutting edges and ends and with the long dimension of each block at right angles to blocks in each subsequent layer. Offset joints of blocks in successive layers.

C. Install geofoam connectors at each layer of geofoam to resist horizontal displacement according to geofoam manufacturer's written instructions.

D. Cover geofoam with separation geotextile before placing overlying soil materials.

3.16 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.17 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698, ASTM D 1557:
   1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill soil material at 95 percent.
   2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 92 percent.
   3. Under turf or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 85 percent.
   4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.18 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
   1. Turf or Unpaved Areas: Plus or minus 1 inch (25 mm)
   2. Walks: Plus or minus 1 inch (25 mm)
   3. Pavements: Plus or minus 1/2 inch (13 mm)

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

3.19 SUBSURFACE DRAINAGE

A. Subdrainage Pipe: Specified in Section 334600 "Subdrainage."

B. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch (150-mm) course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches (300 mm) of filter material, placed in compacted layers 6 inches (150 mm) thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches (150 mm).
   1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698 with a minimum of two passes of a plate-type vibratory compactor.

C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches (300 mm) of final subgrade, in compacted layers 6 inches (150 mm) thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches (150 mm).
   1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698 with a minimum of two passes of a plate-type vibratory compactor.
   2. Place and compact impervious fill over drainage backfill in 6-inch- (150-mm-) thick compacted layers to final subgrade.

3.20 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
   1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
   2. Place base course material over subbase course under hot-mix asphalt pavement.
   3. Shape subbase course and base course to required crown elevations and cross-slope grades.
   4. Place subbase course and base course 6 inches (150 mm) or less in compacted thickness in a single layer.
   5. Place subbase course and base course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
   6. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698, ASTM D 1557.

C. Pavement Shoulders: Place shoulders along edges of subbase cours[and base course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 698, ASTM D 1557.

3.21 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
   1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
   2. Place drainage course 6 inches (150 mm) or less in compacted thickness in a single layer.
   3. Place drainage course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
   4. Compact each layer of drainage course to required cross sections and thicknesses to not

less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.22 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
   1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
   2. Determine that fill material classification and maximum lift thickness comply with requirements.
   3. Determine, during placement and compaction that in-place density of compacted fill complies with requirements.

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2937, and ASTM D 6938, as applicable. Tests will be performed at the following locations and frequencies:
   1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. (186 sq. m) or less of paved area or building slab but in no case fewer than three tests.
   2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet (30 m) or less of wall length but no fewer than two tests.
   3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet (46 m) or less of trench length but no fewer than two tests.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.23 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent

construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.24 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.

1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

SECTION 312319
DEWATERING

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Contract Documents apply to this Section.

1.2 SUMMARY

A. Section includes construction dewatering.

B. Related Requirements:
1. Section 013233 "Photographic Documentation" for recording preexisting conditions and dewatering system progress.
2. Section 312000 "Earth Moving" for excavating, backfilling, site grading, and controlling surface-water runoff and ponding.

1.3 ALLOWANCES

A. Dewatering observation wells are part of dewatering allowance.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference:
1. Verify availability of Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review condition of site to be dewatered including coordination with temporary erosion-control measures and temporary controls and protections.
3. Review geotechnical report.
4. Review proposed site clearing and excavations.
5. Review existing utilities and subsurface conditions.
6. Review observation and monitoring of dewatering system.

1.5 ACTION SUBMITTALS

A. Shop Drawings: For dewatering system, prepared by or under the supervision of a qualified professional engineer.
1. Include plans, elevations, sections, and details.
2. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.
3. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
4. Include written plan for dewatering operations including sequence of well and well-point placement coordinated with excavation shoring and bracings and control procedures to be

adopted if dewatering problems arise.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data:

B. Field quality-control reports.

C. Existing Conditions: Using photographs or video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by dewatering operations. Submit before Work begins.

D. Record Drawings: Identify locations and depths of capped wells and well points and other abandoned-in-place dewatering equipment.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer that has specialized in design of dewatering systems and dewatering work.

1.8 FIELD CONDITIONS

A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from this data.
   1. Make additional test borings and conduct other exploratory operations necessary for dewatering according to the performance requirements.
   2. The geotechnical report is referenced elsewhere in Project Manual.

B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2- PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.
   1. Design dewatering system, including comprehensive engineering analysis by a qualified professional engineer.
   2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, prevention of flooding in excavation, and

prevention of damage to subgrades and permanent structures.
3. Prevent surface water from entering excavations by grading, dikes, or other means.
4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
5. Remove dewatering system when no longer required for construction.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations of authorities having jurisdiction.

PART 3- EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.
1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site or surrounding area.
2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Provide temporary grading to facilitate dewatering and control of surface water.

D. Protect and maintain temporary erosion and sedimentation controls during dewatering operations.

3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.
1. Space well points or wells at intervals required to provide sufficient dewatering.
2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Place dewatering system into operation to lower water to specified levels before excavating below ground-water level.

C. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

D. Provide standby equipment on-site, installed, and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 OPERATION

A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

B. Operate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.
   1. Do not permit open sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
   2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
   3. Maintain piezometric water level a minimum of 24 inches (600 mm) below bottom of excavation.

C. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

D. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches (900 mm) below overlying construction.

3.4 FIELD QUALITY CONTROL

A. Observation Wells: Provide observation wells or piezometers, take measurements, and maintain at least the minimum number indicated; additional observation wells may be required by authorities having jurisdiction.
   1. Observe and record daily elevation of ground water and piezometric water levels in observation wells.
   2. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. In areas where observation wells are not functioning properly, suspend construction activities until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.
   3. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.

B. Survey-Work Benchmarks: Resurvey benchmarks regularly during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

C. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.

D. Prepare reports of observations.

3.5 PROTECTION

A. Protect and maintain dewatering system during dewatering operations.

B. Promptly repair damages to adjacent facilities caused by dewatering.

END OF SECTION 312319

SECTION 315000
EXCAVATION SUPPORT AND PROTECTION

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Contract Documents apply to this Section.

1.2 SUMMARY

A. Section includes temporary excavation support and protection systems.

B. Related Requirements:
1. Section 013233 "Photographic Documentation" for recording preexisting conditions and excavation support and protection system progress.
2. Section 312000 "Earth Moving" for excavating and backfilling and for controlling surface-water runoff and ponding.
3. Section 312319 "Dewatering" for dewatering excavations.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference:
1. Review geotechnical report.
2. Review existing utilities and subsurface conditions.
3. Review coordination for interruption, shutoff, capping, and continuation of utility services.
4. Review proposed excavations.
5. Review proposed equipment.
6. Review monitoring of excavation support and protection system.
7. Review coordination with waterproofing.
8. Review abandonment or removal of excavation support and protection system.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, performance properties, and dimensions of individual components and profiles, and calculations for excavation support and protection system.

B. Shop Drawings: For excavation support and protection system, prepared by or under the supervision of a qualified professional engineer.
1. Include plans, elevations, sections, and details.
2. Show arrangement, locations, and details of soldier piles, piling, lagging, tiebacks, bracing, and other components of excavation support and protection system according to engineering design.
3. Indicate type and location of waterproofing.
4. Include a written plan for excavation support and protection, including sequence of construction of support and protection coordinated with progress of excavation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:

B. Contractor Calculations: For excavation support and protection system. Include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Existing Conditions: Using photographs or video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by inadequate performance of excavation support and protection systems. Submit before Work begins.

D. Record Drawings: Identify locations and depths of capped utilities, abandoned-in-place support and protection systems, and other subsurface structural, electrical, or mechanical conditions.

1.6 FIELD CONDITIONS

A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:
   1. Notify Architect and Construction Manager no fewer than two days in advance of proposed interruption of utility.
   2. Do not proceed with interruption of utility without Architect's and Construction Manager's written permission.

B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from the data.
   1. Make additional test borings and conduct other exploratory operations necessary for excavation support and protection according to the performance requirements.
   2. The geotechnical report is included elsewhere in Project Manual.

C. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2- PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Provide, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting earth and hydrostatic pressures and superimposed and construction loads.
   1. Contractor Design: Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer.
   2. Prevent surface water from entering excavations by grading, dikes, or other means.
   3. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.
   4. Continuously monitor vibrations, settlements, and movements to ensure stability of excavations and constructed slopes and to ensure that damage to permanent structures is

prevented.

2.2 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.

C. Steel Sheet Piling: ASTM A 328/A 328M, ASTM A 572/A 572M, or ASTM A 690/A 690M; with continuous interlocks.
1. Corners: Site-fabricated mechanical interlock or Roll-formed corner shape with continuous interlock as shown on the plans.

D. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of size and strength as shown on the plans.

E. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.

F. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

G. Tiebacks: Steel bars, ASTM A 722/A 722M.

H. Tiebacks: Steel strand, ASTM A 416/A 416M.

PART 3- EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.
1. Shore, support, and protect utilities encountered.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Locate excavation support and protection systems clear of permanent construction so that construction and finishing of other work is not impeded.

3.2 SOLDIER PILES AND LAGGING

A. Install steel soldier piles before starting excavation. Extend soldier piles below excavation grade level to depths adequate to prevent lateral movement. Space soldier piles at regular intervals not to exceed allowable flexural strength of wood lagging. Accurately align exposed faces of flanges to vary not more than 2 inches (50 mm) from a horizontal line and not more than 1:120 out of vertical alignment or as shown on the plans.

B. Install wood lagging within flanges of soldier piles as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.

C. Install wales horizontally at locations indicated on Drawings and secure to soldier piles.

3.3 SHEET PILING

A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock vertical edges to form a continuous barrier.

B. Accurately place the piling, using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer. Limit vertical offset of adjacent sheet piling to 60 inches (1500 mm). Accurately align exposed faces of sheet piling to vary not more than 2 inches (50 mm) from a horizontal line and not more than 1:120 out of vertical alignment or as shown on the plans

C. Cut tops of sheet piling to uniform elevation at top of excavation.

3.4 TIEBACKS

A. Drill, install, grout, and tension tiebacks.

B. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks.
1. Have test loading observed by a qualified professional engineer responsible for design of excavation support and protection system.

C. Maintain tiebacks in place until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.5 BRACING

A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.
1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Architect.
2. Install internal bracing if required to prevent spreading or distortion of braced frames.
3. Maintain bracing until structural elements are supported by other bracing or until permanent construction can withstand lateral earth and hydrostatic pressures.

3.6 FIELD QUALITY CONTROL

A. Survey-Work Benchmarks: Resurvey benchmarks regularly as shown on the plans during installation of excavation support and protection systems, excavation progress, and for as long as excavation remains open. Maintain an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Architect if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

B. Promptly correct detected bulges, breakage, or other evidence of movement to ensure that excavation support and protection system remains stable.

C. Promptly repair damages to adjacent facilities caused by installation or faulty performance of

excavation support and protection systems.

3.7 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and earth and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils and rock or damaging structures, pavements, facilities, and utilities.
   1. Remove excavation support and protection systems to a minimum depth of 48 inches (1200 mm) below overlying construction and abandon remainder.
   2. Fill voids immediately with approved backfill compacted to density specified in Section 312000 "Earth Moving."

   3. Repair or replace, as approved by Architect, adjacent work damaged or displaced by removing excavation support and protection systems.

B. Leave excavation support and protection systems permanently in place.

END OF SECTION 315000

SECTION 321216
ASPHALT PAVING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Contract Documents apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Hot-mix asphalt patching.
2. Hot-mix asphalt paving.
3. Hot-mix asphalt paving overlay.
4. Asphalt surface treatments.
5. Pavement-marking paint.
6. Traffic-calming devices.
7. Imprinted asphalt.

B. Related Sections:
1. Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.
2. Division 32 Sections for other paving installed as part of crosswalks in asphalt pavement areas.
3. Division 7 Section "Joint Sealants" for joint sealants and fillers at paving terminations.

1.3 SYSTEM DESCRIPTION

A. Provide hot-mix asphalt pavement according to the materials, workmanship, and other applicable requirements of the standard specifications of the state or of authorities having Jurisdiction.
1. Standard Specification: As indicated.
2. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section and arc superseded by those contained within this Contract and Section.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference:
1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
b. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

1.5 SUBMITTALS

A. Product Data: For each product specified. Include technical data and tested physical and performance properties.

B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.

C. Job-Mix Designs: For each job mix proposed for the Work.

D. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate dedicated handicapped spaces with international graphics symbol.

E. Samples: 12 by 12 inches minimum, of paving fabric.

F. Material Test Reports: Indicate and interpret test results for compliance of materials with requirements indicated.

G. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed hot-mix asphalt paving similar in scope, material, and extent to that indicated for this project, and whose work has resulted in construction with a record of successful in-service performance.

B. Manufacturer Qualifications: A firm experienced in manufacturing hot-mix asphalt paving like that indicated for this project and with a record of successful in-service performance.
   1. Firm shall be a registered and approved paving mix manufacturer with authorities having jurisdiction or with the DOT of the state in which Project is located.

C. Testing Agency Qualifications: Demonstrate to DCAS's satisfaction, based on Architect's evaluation of criteria conforming to ASTM D 3666, that the independent testing agency has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.

D. Regulatory Requirements: Conform to applicable standards of authorities having jurisdiction for asphalt paving work on public property.

E. Asphalt-Paving Publication: Comply with AI's "The Asphalt Handbook," except where more stringent requirements are indicated.

F. Site Meeting: the Contractor shall meet with DCAS at the Project site prior to commencing the work of this Section to review methods and procedures related to asphalt paving including, but not limited to, the following:
   1. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
   2. Review condition of substrate and preparatory work performed by other trades.
   3. Review requirements for protecting paving work, including restriction of traffic during

installation period and for remainder of construction period.

4. Review and finalize, construction schedule for paving and related work. Verify availability of materials, paving Installer's personnel, and equipment required to execute the Work without delays.
5. Review inspection and testing requirements, governing regulations, and proposed installation procedures.
6. Review forecasted weather conditions and procedures for coping with unfavorable conditions.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location and within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if substrate is wet or excessively damp or if the following conditions are not met:
1. Prime and Tack Coats: Minimum surface temperature of 60 deg. F (15.5 deg. C).
2. Asphalt Base Course: Minimum surface temperature of 40 deg. F (4 deg. C) and rising at time of placement.
3. Asphalt Surface Course: Minimum surface temperature of 60 deg. F (l5.5 deg. C) at time of placement.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg. F (4 deg. C) for oil-based materials, 50 deg. F (10 deg. C) for water-based materials, and not exceeding 95 deg. F (35 deg. C).

PART 2- PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: Sound: angular crushed stone; crushed gravel; or properly cured, crushed blast-furnace slag; complying with ASTM D 692.

C. Fine Aggregate: Sharp-edged natural sand or sand prepared from stone; gravel, properly cured blast-furnace slag, or combinations thereof; complying with ASTM D 1073.
1. For hot-mix asphalt limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with ASTM D 242.

2.2 ASPHALT MATERIALS

A. Asphalt Cement: ASTM D 3381 for viscosity-graded material: ASTM D 946 for penetration graded material.

B. Asphalt Cement: ASTM D 3381 for viscosity-graded material.

C. Undersealing Asphalt: ASTM D 3141, pumping consistency.

D. Prime Coat: ASTM D 2027; medium-curing cutback asphalt; MC-30, MC-70, or MC- 250.

E. Prime Coat: Asphalt emulsion prime conforming to state DOT requirements.

F. Prime Coat: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.

G. Tack Coat: ASTM D 977, emulsified asphalt or ASTM D 2397,
cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.

H. Water: Potable.

2.3 AUXILIARY MATERIALS

A. Herbicide: Commercial chemical for weed control, registered by Environmental Protection Agency (EPA). Provide granular, liquid, or wet table powder form.

B. Sand: ASTM D 1073, grade Nos. 2 or 3.

C. Paving Geotextile: Nonwoven polypropylene, specifically designed for paving applications, resistant to chemical attack, rot, and mildew.

D. Pavement-Marking Paint: Alkyd-resin type, ready-mixed, complying with FS TT -P-115, Type I, or AASHTO M-248, Type N.

E. Pavement-Marking Paint: Latex, water-base emulsion, ready-mixed, complying with FS TT-P-1952.
1. Color: As indicated.

2.4 MIXES

A. Hot-Mix Asphalt: Provide dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction; designed according to procedures in AI's "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types;" and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
2. Base Course: As indicated.
3. Surface Course: As indicated.

B. Hot-Mix Asphalt: Provide dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and designed according to procedures in AI's "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types."
1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
2. Provide mixes complying with the composition, grading, and tolerance requirement of ASTM D 3515 for the following nominal, maximum aggregate sizes:
   a. Base Course: 1 inch.
   b. Surface Course: 1/2 inch.

C. Emulsified-Asphalt Slurry: ASTM D 3910, consisting of emulsified asphalt, fine aggregates, and mineral fillers and as follows:
1. Composition: Type 1.
2. Composition: Type 2.
3. Composition: Type 3.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction]. Limit vehicle speed to 3 mph (5 km/h).
2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 COLD MILLING

A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.
1. Mill to a depth of 1-1/2 inches (38 mm), 2 inches (50 mm), & 3 inches (75 mm).
2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
3. Control rate of milling to prevent tearing of existing asphalt course.
4. Repair or replace curbs, manholes, and other construction damaged during cold milling.
5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
6. Patch surface depressions deeper than 1 inch (25 mm) after milling, before wearing course is laid.
7. Handle milled asphalt material according to approved waste management plan required in Section 017419 "Construction Waste Management and Disposal."

8. Keep milled pavement surface free of loose material and dust.
9. Do not allow milled materials to accumulate on-site.

3.3 PATCHING

A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.
   1. Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
   2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.

C. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
   1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
   2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

D. Placing Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

E. Placing Patch Material: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.4 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.

B. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.

C. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of [1/4 inch (6 mm)].
   1. Clean cracks and joints in existing hot-mix asphalt pavement.
   2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.
   3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.

3.5 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
   1. Sweep loose granular panicles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
   1. Mix herbicide with prime coat when formulated by manufacturer for that purpose.

C. Prime Coat: Apply uniformly over surface of compacted-aggregate base at a rate of 0.15 to 0.50 gal/sq. yd. (0.7 to 23 L/sq. m). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure for 72 hours minimum.
   1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use just enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
   2. Protect primed substrate from damage until ready to receive paving.

D. Emulsified Asphalt Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.10 to 0.30 gal./sq. yd. per inch depth (0.5 to 1.40 L/sq. m per 25 mm depth). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.
   1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
   2. Protect primed substrate from damage until ready to receive paving.

E. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
   1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
   2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.6 PAVING GEOTEXTILE INSTALLATION

A. Apply bond coat, consisting of asphalt cement, uniformly to existing surfaces at a rate of 0.20 to 0.30 gal/sq. yd. (0.8 to 12 L/sq. m).

B. Place paving geotextile promptly according to manufacturer's written instructions. Broom or roll geotextile smooth and free of wrinkles and folds. Overlap longitudinal joints 4 inches and transverse joints 6 inches.

C. Protect paving geotextile from traffic and other damage and place overlay paving the same day.

3.7 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt mix on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness, when compacted.
   1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
   2. Place hot-mix asphalt surface course in single lift.

3. Spread mix at minimum temperature of 250 deg. F (121 deg. C).
4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide, except where infill edge strips of a lesser width arc required.
1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips.
2. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.8 JOINTS

A. Construct joints to ensure continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.
1. Clean contact surfaces and apply tack coat.
2. Offset longitudinal joints in successive courses a minimum of 6 inches.
3. Offset transverse joints in successive courses a minimum of 24 inches.
4. Construct transverse joints by bulkhead method or sawed vertical face method as described in AI's "The Asphalt Handbook."
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.9 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.
1. Complete compaction before mix temperature cools to 185 deg. F (85 deg. C).

B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Repair surfaces by loosening displaced material, filling with hot-mix asphalt, and rerolling to required elevations.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling, while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
1. Average Density: 96 percent of reference laboratory density according to [ASTM D 6927] [or] [AASHTO T 245], but not less than 94 percent nor greater than 100 percent.
2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.10 ASPHALT CURBS

A. Construct hot-mix asphalt curbs over compacted pavement surfaces. Apply a light tack coat unless pavement surface is still tacky and free from dust. Spread mix at a minimum temperature of 250 deg. F (121 deg. C).
1. Asphalt Mix: Same as pavement surface-course mix.

B. Place hot-mix asphalt to curb cross section indicated or, if not indicated, to local standard shapes, by machine or by hand in wood or metal forms. Tamp hand-placed materials and screed to smooth finish. Remove forms after hot-mix asphalt has cooled.

3.11 ASPHALT TRAFFIC-CALMING DEVICES

A. Construct hot-mix asphalt speed [bumps] [humps] [cushions] [and] [tables] over compacted pavement surfaces. Apply a tack coat unless pavement surface is still tacky and free from dust. Spread mix at a minimum temperature of 250 deg. F (121 deg. C).
1. Tack Coat Application: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m.)
2. Asphalt Mix: Same as pavement surface-course mix.
3. Before installation, mill pavement that will be in contact with bottom of traffic-calming device. Mill to a depth of 1 inch (25 mm) from top of pavement to a clean, rough profile.

B. Place and compact hot-mix asphalt to cross section indicated, by machine or by hand in wood or metal forms. Tamp hand-placed materials and screed to smooth finish. Remove forms after hot-mix asphalt has cooled.

3.12 INSTALLATION TOLERANCES

A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:
1. Base Course: Plus or minus 1/2 inch.
2. Surface Course: Plus 1/4 inch, no minus.

B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to pages areas:
1. Base Course: 1/4 inch.
2. Surface Course: 1/8 inch.
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum

allowable variance from template is 1/4 inch.

3.14 SURFACE TREATMENTS

A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. (0.45 to 0.7 L/sq. m) to existing asphalt pavement and allow to cure. With fine sand, lightly dust areas receiving excess fog seal.

3.15 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
B. Allow paving to cure for 30 days before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils 0.4 mm).

3.16 FIELD QUALITY CONTROL

A. Testing Agency: DCAS will engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports
   1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.

B. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

E. Asphalt Traffic-Calming Devices: Finished height of traffic-calming devices above pavement will be measured for compliance with tolerances.

F. In-Place Density: Samples of uncompacted paving mixtures and compacted pavement will be secured by testing agency according to ASTM D 979.
   1. Reference laboratory density will be determined by averaging results from 4 samples of hot mix asphalt- paving mixture delivered daily to site, prepared according to ASTM D 2, and compacted according to job- mix specifications.
   2. Reference maximum theoretical density will be determined by averaging results from 4 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
   3. In-place density of compacted pavement will be determined by testing core samples according to

ASTM D 1188 or ASTM D 2726.

a. One core sample will be taken, for every 1000 sq. yd. (836 sq. m) or less of installed pavement, but in no case will fewer than 3 cores be taken.
b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2150 and correlated with ASTM D 1188 or ASTM D 2726.

G. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

H. All field Quality Control measures related ·to the Work of this Section including but not limited to inspection, testing and reporting to DCAS shall be deemed included in the unit Prices, and at no additional cost to the City.

3.14 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

END OF SECTION 321216

SECTION 321313
CONCRETE PAVING

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Contract Documents apply to this Section.

1.2 SUMMARY

A. Section Includes Concrete Paving:
1. Driveways.
2. Roadways.
3. Parking lots.
4. Curbs and gutters.
5. Walks.

B. Related Requirements:
1. Section 033000 "Cast-in-Place Concrete" for general building applications of concrete.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

1. Preinstallation Conference: Review methods and procedures related to concrete paving, including but not limited to, the following:
   a. Concrete mixture design.
   b. Quality control of concrete materials and concrete paving construction practices.
2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:
   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete manufacturer.
   d. Concrete paving Subcontractor.
   e. Manufacturer's representative of stamped concrete paving system used for stamped detectable warnings.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

C. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color selection.

D. Samples for Verification: For each type of product or exposed finish, prepared as Samples of size indicated below:
   1. Exposed Aggregate: 10-lb (4.5-kg) Sample of each mix.

E. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Material Certificates: For the following, from manufacturer:
   1. Cementitious materials.
   2. Steel reinforcement and reinforcement accessories.
   3. Fiber reinforcement.
   4. Admixtures.
   5. Curing compounds.
   6. Applied finish materials.
   7. Bonding agent or epoxy adhesive.
   8. Joint fillers.

C. Material Test Reports: For each of the following:
   1. Aggregates: As shown on the plans
   2. Retain "Field quality-control reports" Paragraph below if Contractor is responsible for field quality-control testing and inspecting.

D. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Stamped Detectable Warning Installer Qualifications: An employer of workers trained and approved by manufacturer of stamped concrete paving systems.

B. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready- mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual- Section 3, "Plant Certification Checklist").

C. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
   1. Personnel conducting field tests shall be qualified as ACI Concrete Field-Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups of full-thickness sections of concrete paving to demonstrate typical joints; surface finish, texture, and color; curing; and standard of workmanship.
2. Build mockups of concrete paving in the location and of the size indicated or, if not indicated, build mockups where directed by Architect and not less than 96 inches (2400 mm) by 96 inches (2400 mm)
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing on concrete paving mixtures.

1.9 FIELD CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

C. Hot-Weather Concrete Placement: Comply with ACI 301 (ACI 301M) and as follows when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

PART 2- PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 (ACI 301M) unless otherwise indicated.

2.2 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
   1. Use flexible or uniformly curved forms for curves with a radius of 100 feet (30.5 m) or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

A. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, fabricated from as-drawn steel wire into flat sheets.

B. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

C. Epoxy-Coated Welded-Wire Reinforcement: ASTM A 884/A 884M, Class A, plain steel.

D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.

E. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 (Grade 420) deformed bars.

F. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M; with ASTM A 615/A 615M, Grade 60 (Grade 420) deformed bars.

G. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60 (Grade 420) deformed bars; assembled with clips.

H. Plain-Steel Wire: ASTM A 1064/A 1064M, as drawn.

I. Deformed-Steel Wire: ASTM A 1064/A 1064M.

J. Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A; coated, as drawn.

K. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420) plain-steel bars as shown on the plans. Cut bars true to length with ends square and free of burrs.

L. Epoxy-Coated, Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60 (Grade 420) plain-steel bars.

M. Tie Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.

N. Hook Bolts: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in

position during concreting operations, and to permit removal without damage to concrete or hook bolt.

O. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:
   1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
   2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

P. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.

Q. Zinc Repair Material: ASTM A 780/A 780M.

2.4 CONCRETE MATERIALS

A. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:
   1. Portland Cement: ASTM C 150/C 150M, gray or white portland cement and Type as shown on the plans.
   2. Fly Ash: ASTM C 618, Class C or Class F as shown on the plans.
   3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
   4. Blended Hydraulic Cement: ASTM C 595/C 595M, Type cement. As shown on the plans

B. Normal-Weight Aggregates: ASTM C 33/C 33M, as shown on the plans uniformly graded. Provide aggregates from a single source with documented service-record data of at least 10 years' satisfactory service in similar paving applications and service conditions using similar aggregates and cementitious materials.
   1. Maximum Coarse-Aggregate Size as shown on the plans nominal.
   2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Exposed Aggregate: Selected, hard, and durable; washed; free of materials with deleterious reactivity to cement or that cause staining; from a single source, with gap-graded coarse aggregate as follows:
   1. Aggregate Sizes: as shown on the plans nominal
   2. Retain "Aggregate Source, Shape, and Color" Subparagraph below if a particular aggregate is required or to specify details of acceptable aggregates.
   3. Aggregate Source, Shape, and Color: as shown on the plans.

D. Air-Entraining Admixture: ASTM C 260/C 260M.

E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain no more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

F. Color Pigment: ASTM C 979/C 979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable nonfading, and resistant to lime and other alkalis.
1. Color: As indicated by manufacturer's designation

G. Water: Potable and complying with ASTM C 94/C 94M.

2.5 FIBER REINFORCEMENT

A. Synthetic Fiber: Monofilament polypropylene fibers engineered and designed for use in decorative concrete paving, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches (13 to 38 mm) long.

B. Synthetic Fiber: Fibrillated polypropylene fibers engineered and designed for use in decorative concrete paving, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches (13 to 38 mm) long.

2.6 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry**.**

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

F. White, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B, dissipating.

2.7 RELATED MATERIALS

A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork, or self-expanding cork in preformed strips.

B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

C. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy-Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:
   1. Types and bearings as shown on the plans, for bonding hardened or freshly mixed concrete to hardened concrete.

E. Chemical Surface Retarder: Water-soluble, liquid, set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch (3 to 6 mm).

F. Pigmented Mineral Dry-Shake Hardener: Factory-packaged, dry combination of portland cement, graded quartz aggregate, color pigments, and plasticizing admixture. Use color pigments that are finely ground, nonfading mineral oxides interground with cement.
   1. Color: As indicated by manufacturer's designation.

G. Rock Salt: Sodium chloride crystals, kiln dried, coarse gradation with 100 percent passing 3/8-inch (9.5-mm) sieve and 85 percent retained on a No. 8 (2.36-mm) sieve.

2.8 STAMPED DETECTABLE WARNING MATERIALS

A. Detectable Warning Stamp: Semirigid polyurethane mats with formed underside capable of imprinting detectable warning pattern on plastic concrete; perforated with a vent hole at each dome.
   1. Size of Stamp: One piece, matching detectable warning area shown on Drawings [24 by 24 inches (610 by 610 mm)] [24 by 36 inches (610 by 914 mm)] [24 by 48 inches (610 by 1220 mm)] [26 by 26 inches (660 by 660 mm)] [26 by 36 inches (660 by 914 mm).

B. Liquid Release Agent: Manufacturer's standard, clear, evaporating formulation designed to facilitate release of stamp mats.

2.9 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301 (ACI 301M), for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.
   1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
   2. When automatic machine placement is used, determine design mixtures and obtain

laboratory test results that comply with or exceed requirements.

B. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
   1. Fly Ash or Pozzolan: 25 percent.
   2. Slag Cement: 50 percent.
   3. Combined Fly Ash or Pozzolan, and Slag Cement: 50 percent, with fly ash or pozzolan not exceeding 25 percent.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
   1. Air Content: As shown on the plans percent plus or minus 1-1/2 percent for 1-1/2-inch (38-mm) nominal maximum aggregate size.
   2. Air Content: As shown on the plans percent plus or minus 1-1/2 percent for 1-inch (25-mm) nominal maximum aggregate size.
   3. Air Content: As shown on the plans percent plus or minus 1-1/2 percent for 3/4-inch (19-mm) nominal maximum aggregate size.

D. Limit water-soluble, chloride-ion content in hardened concrete to [**0.15**] [**0.30**] percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing admixture as shown on the plans in concrete as required for placement and workability.
   2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

F. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd. (0.60 kg/cu. m.

G. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

H. Concrete Mixtures: Normal-weight concrete.
   1. Compressive Strength (28 Days): As shown on the plans.
   2. Maximum W/C Ratio at Point of Placement: As shown on the plans.
   3. Slump Limit: As shown on the plans.

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M. Furnish batch certificates for each batch discharged and used in the Work.
   1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32

deg C), reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
   1. For concrete batches of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
   2. For concrete batches larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
   3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3- EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.
   1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph (5 km/h).
   2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
   3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch (13 mm) according to requirements in Section 312000 "Earth Moving."

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Zinc-Coated Reinforcement: Use galvanized-steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.

F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.

G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch (50-mm) overlap of adjacent mats.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
   1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
   1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
   2. Provide tie bars at sides of paving strips where indicated.
   3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
   4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
   5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
   1. Locate expansion joints at intervals of 50 feet (15.25 m) unless otherwise indicated.
   2. Extend joint fillers full width and depth of joint.
   3. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
   4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
   5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
   6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows, to match jointing of existing adjacent concrete paving:
   1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch (6-mm) radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.
      a. Tolerance: Ensure that grooved joints are within 3 inches (75 mm) either way from centers of dowels.
   2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
      a. Tolerance: Ensure that sawed joints are within 3 inches (75 mm) either way from centers of dowels.
   3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch (6-mm) radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 (ACI 301M) requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 (ACI 301M) by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
   1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

H. Screed paving surface with a straightedge and strike off.

I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

K. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.
   1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
   1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
   2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.
   3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch (1.6 to 3 mm) deep with a stiff-bristled broom, perpendicular to line of traffic.

3.8 SPECIAL FINISHES

A. Monolithic Exposed-Aggregate Finish: Expose coarse aggregate in paving surface as follows:
   1. Immediately after float finishing, spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
   2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.
   3. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.
   4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.

A. Seeded Exposed-Aggregate Finish: Immediately after initial floating, spread a single layer of aggregate uniformly on paving surface. Tamp aggregate into plastic concrete and float finish to entirely embed aggregate with mortar cover of 1/16 inch (1.6 mm).
   1. Spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
   2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove sheeting when ready to continue finishing operations.
   3. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.
   4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.

B. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on paving surface according to manufacturer's written instructions and as follows:
   1. Uniformly spread lb/100 sq. ft. 12 kg/10 sq. m) as shown on the plans of dampened, slip-resistive aggregate over paving surface in two applications. Tamp aggregate flush with surface using a steel trowel, but do not force below surface.
   2. Uniformly distribute approximately two-thirds of slip-resistive aggregate over paving surface with mechanical spreader, allow to absorb moisture, and embed by power floating. Follow power floating with a second slip-resistive aggregate application, uniformly distributing remainder of material at right angles to first application to ensure uniform coverage and embed by power floating.
   3. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
   4. After curing, lightly work surface with a steel-wire brush or abrasive stone and water to expose nonslip aggregate.

C. Rock-Salt Finish: After initial floating, troweling or brooming, uniformly spread rock salt over paving surface at the rate of 5 lb/100 sq. ft. (0.2 kg/10 sq. m).
   1. Embed rock salt into plastic concrete with roller or magnesium float.

2. Cover paving surface with 1-mil- (0.025-mm-) thick polyethylene sheet and remove sheet when concrete has hardened and seven-day curing period has elapsed.
3. After seven-day curing period, saturate concrete with water and broom-sweep surface to dissolve remaining rock salt, thereby leaving pits and holes.

D. Pigmented Mineral Dry-Shake Hardener Finish: After initial floating, apply dry-shake materials to paving surface according to manufacturer's written instructions and as follows:
1. Uniformly spread dry-shake hardener at a rate of 100 lb/100 sq. ft. (49 kg/10 sq. m) unless greater amount is recommended by manufacturer to match paving color required.
2. Uniformly distribute approximately two-thirds of dry-shake hardener over the concrete surface with mechanical spreader; allow hardener to absorb moisture and embed it by power floating. Follow power floating with a second application of pigmented mineral dry-shake hardener, uniformly distributing remainder of material at right angles to first application to ensure uniform color, and embed hardener by final power floating.
3. After final power floating, apply a hand-troweled finish followed by a broom finish.
4. Cure concrete with curing compound recommended by dry-shake hardener manufacturer. Apply curing compound immediately after final finishing.

3.9 DETECTABLE WARNING INSTALLATION

A. Blockouts: Form blockouts in concrete for installation of detectable paving units

B. Cast-in-Place Detectable Warning Tiles: Form blockouts in concrete for installation of tiles. Screed surface of concrete where tiles are to be installed to elevation, so that edges of installed tiles will be flush with surrounding concrete paving. Embed tiles in fresh concrete to comply with Tactile Warning Surfacing immediately after screeding concrete surface.

C. Stamped Detectable Warnings: Install stamped detectable warnings as part of a continuous concrete paving placement and according to stamp-mat manufacturer's written instructions.
1. Before using stamp mats, verify that the vent holes are unobstructed.
2. Apply liquid release agent to the concrete surface and the stamp mat.
3. Stamping: While initially finished concrete is plastic, accurately align and place stamp mats in sequence. Uniformly load, gently vibrate, and press mats into concrete to produce imprint pattern on concrete surface. Load and tamp mats directly perpendicular to the stamp-mat surface to prevent distortion in shape of domes. Press and tamp until mortar begins to come through all of the vent holes. Gently remove stamp mats.
4. Trimming: After 24 hours, cut off the tips of mortar formed by the vent holes.
5. Remove residual release agent according to manufacturer's written instructions, but no fewer than three days after stamping concrete. High-pressure-wash surface and joint patterns, taking care not to damage stamped concrete. Control, collect, and legally dispose of runoff.

3.10 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound or]a combination of these as follows:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period, using cover material and waterproof tape.
   3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.11 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 (ACI 117M) and as follows:
   1. Elevation: 3/4 inch (19 mm).
   2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
   3. Surface: Gap below 10-feet- (3-m-) long; unleveled straightedge not to exceed 1/2 inch (13 mm).
   4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches (13 mm per 300 mm) of tie bar.
   5. Lateral Alignment and Spacing of Dowels: 1 inch (25 mm).
   6. Vertical Alignment of Dowels: 1/4 inch (6 mm).
   7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches (6 mm per 300 mm) of dowel.
   8. Joint Spacing: 3 inches (75 mm).
   9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
   10. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
   1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) 5000 sq. ft. (465 sq. m) or fraction thereof of each concrete mixture placed each day.
      a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
   2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
   3. Air Content: ASTM C 231/C 231M, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when it is 80 deg F (27 deg C) and above, and one test for each composite sample.
   5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
   6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.
      a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28- day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Concrete paving will be considered defective if it does not pass tests and inspections.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

I. Prepare test and inspection reports.

3.13 REPAIR AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 321400
UNIT PAVING

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Contract Documents apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Brick pavers set in aggregate and mortar setting beds.
2. Concrete pavers set in aggregate and mortar setting beds.
3. Asphalt-block pavers set in bituminous setting beds.
4. Stone pavers set in aggregate and mortar setting beds.
5. Plastic, Steel and Aluminum edge restraints.
6. Cast-in-place concrete edge restraints.
7. Precast concrete curbs.
8. Stone curbs.

B. Related Sections:
1. Division 07 Section "Self-Adhering Sheet Waterproofing, Elastomeric Sheet Waterproofing, Thermoplastic Sheet Waterproofing, Hot Fluid-Applied Rubberized Asphalt Waterproofing, Cold Fluid-Applied Waterproofing" for waterproofing and protection board under plaza deck pavers.
2. Division 07 Section "Built-up Asphalt Roofing, Modified Bituminous Membrane Roofing, Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing, Ethylene-Propylene-Diene-Monomer (EPDM) Roofing, Polyvinyl-Chloride (PVC) Roofing, Thermoplastic Polyolefin (TPO) Roofing, Modified" for roof pavers.
. Division 09 Section "Stone Flooring" for dimension stone paving.
3. Division 32 Section "Asphalt Paving" for asphalt base under unit pavers.
6. Division 32 Section "Concrete Paving"

1.3 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Submit to latex-additive manufacturer, for testing as indicated below, samples of paving materials that will contact or affect mortar and grout that contain latex additives.
1. Use manufacturer's standard test methods to determine whether mortar and grout materials will obtain optimum adhesion with, and will be non-staining to, installed pavers and other materials constituting paver installation.

1.4 ACTION SUBMITTALS

A. Product Data: For materials other than water and aggregates.

B. Product Data: For the following:
1. Pavers.
2. Bituminous setting materials.
3. Mortar and grout materials.
4. Edge restraints.

5. Precast concrete curbs.
6. Stone curbs.

C. Adhesion and Compatibility Test Reports: From latex-additive manufacturer for mortar and grout containing latex additives.

D. Sieve Analyses: For aggregate setting-bed materials, according to ASTM C 136.

E. Samples for Initial Selection: For the following:
1. Each type of unit paver indicated.
2. Joint materials involving color selection.
3. Exposed edge restraints involving color selection.
4. Precast concrete curbs.
5. Granite for stone curbs.

F. Samples for Verification:
1. Full-size units of each type of unit paver indicated. Assemble no fewer than five Samples of each type of unit on suitable backing and grout joints.
2. Joint materials.
3. Exposed edge restraints.
4. Precast concrete curbs.
5. Stone curbs.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of unit paver, joint material, and setting material from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store liquids in tightly closed containers protected from freezing.

E. Store asphalt cement and other bituminous materials in tightly closed containers.

1.7 PROJECT CONDITIONS

A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.

B. Weather Limitations for Bituminous Setting Bed:
   1. Install bituminous setting bed only when ambient temperature is above 40 deg F and when base is dry.
   2. Apply asphalt adhesive only when ambient temperature is above 50 deg F and when temperature has not been below 35 deg F for 12 hours immediately before application. Do not apply when setting bed is wet or contains excess moisture.

C. Weather Limitations for Mortar and Grout:
   1. Cold-Weather Requirements: Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
   2. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602. Provide artificial shade and windbreaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F and higher.
      a. When ambient temperature exceeds 100 deg F, or when wind velocity exceeds 8 mph and ambient temperature exceeds 90 deg F, set pavers within 1 minute of spreading setting-bed mortar.

PART 2- PRODUCTS

2.1 BRICK PAVERS

A. Regional Materials: Provide brick pavers that have been manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Brick Pavers: Light-traffic paving brick; ASTM C 902, Class MX, Type II, Type III, Application PX, Application PA. Provide brick without frogs or cores in surfaces exposed to view in the completed Work.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Glen-Gery Corporation.
      b. Watsontown Brick company
      c. Acme Brick company
      d. Belden Brick Company
      e. Or an Approved Equal
   2. Thickness: 1-1/4 inches, 1-1/2 inches, 1-5/8 inches, 2-1/4 inches, 2-5/8 inches, and 3 inches.
   3. Face Size: 3-3/4 by 7-1/2 inches, 3-5/8 by 7-5/8 inches, 3-5/8 by 11-5/8 inches, 7-5/8 by 7-5/8 inches, 4 by 8 inches, 4 by 12 inches, 8 by 8 inches, 10 by 10 inches, and 12 by 12 inches.
   4. Color: As indicated by manufacturer's designations, Match Architect's sample, or as selected by Architect from manufacturer's full range.

C. Brick Pavers: Heavy vehicular paving brick; ASTM C 1272, Type F, Application PX, Type R, Application PS, Type R, Application PX, Type R, Application PA. Provide brick without frogs or cores in surfaces exposed to view in the completed Work.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Glen-Gery Corporation.
      b. Watsontown Brick company
      c. Acme Brick company
      d. Belden Brick Company
      e. Or an Approved eEqual.

2. Thickness: 2-1/4 inches, 2-5/8 inches, and 3 inches.
3. Face Size: 3-3/4 by 7-1/2 inches, 3-5/8 by 7-5/8 inches, 3-5/8 by 11-5/8 inches, 7-5/8 by 7-5/8 inches, 4 by 8 inches, 4 by 12 inches, 8 by 8 inches, 10 by 10 inches, and 12 by 12 inches.
4. Color: As indicated by manufacturer's designations, Match Architect's sample, or as selected by Architect from manufacturer's full range.

D. Efflorescence: Brick shall be rated "not effloresced" when tested according to ASTM C 67.

E. Temporary Protective Coating: Precoat exposed surfaces of brick pavers with a continuous film of a temporary protective coating that is compatible with brick, mortar, and grout products and can be removed without damaging grout or brick. Do not coat unexposed brick surfaces; handle brick to prevent coated surfaces from contacting backs or edges of other units. If, despite these precautions, coating does contact bonding surfaces of brick, remove coating from bonding surfaces before setting brick.

2.2 CURBS AND EDGE RESTRAINTS

A. Plastic Edge Restraints: Manufacturer's standard triangular PVC extrusions 1-3/4 inches high by 3-1/2 inches wide, 3-1/8 inches high by 9-1/2 inches wide, designed to serve as edge restraints for unit pavers; rigid type for straight edges and flexible type for curved edges, with pipe connectors and 3/8-inch diameter by 12-inch- long steel spikes.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Brickstop Corporation.
   b. Dimex Corporation.
   c. Oly-Ola Edgings, Inc.
   d. Pave Tech Inc.
   e. Or an Approved Equal.

B. Steel Edge Restraints: Manufacturer's standard painted steel edging, 3/16 inch thick by 4 inches high, 1/4 inch thick by 5 inches high with loops pressed from or welded to face to receive stakes at 36 inches o.c., and steel stakes 15 inches long for each loop.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Border Concepts, Inc.
   b. Collier Metal Specialties, Inc.
   c. J. D. Russell Company (The).
   d. Sure-loc Edging Corporation.
   e. Or an Approved Equal.
2. Color: As indicated by manufacturer's designations, Match Architect's sample, and or as selected by Architect from manufacturer's full range.

C. Aluminum Edge Restraints: Manufacturer's standard straight, 1/8-inch- thick by 4-inch- high, straight, 3/16-inch- thick by 4-inch- high, L-shaped, 1/8-inch- thick by 1-3/8-inch- high, L- shaped, 3/16-inch- thick by 2-1/4-inch- high extruded-aluminum edging with loops pressed from face to receive stakes at 12 inches o.c., and aluminum stakes 12 inches long for each loop.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Brickstop Corporation.
   b. Curv-Rite, Inc.
   c. Permaloc Corporation.
   d. Sure-loc Edging Corporation.
   e. Or an Approved Equal.

D. Job-Built Concrete Edge Restraints: Comply with requirements in Division 03 Section "Cast- in-Place Concrete" for normal-weight, air-entrained, ready-mixed concrete with minimum 28- day compressive strength of 5000 psi.

E. Precast Concrete Curbs: Made from normal-weight concrete with a compressive strength not less than 5000 psi, and water absorption not more than 5 percent, in shapes and sizes indicated.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Hanover Architectural Products, Inc.
      b. United Concrete Products, Inc.
      c. Concast engineered Concrete, Inc.
      d. Or an Approved Equal
      2. Color and Texture: As indicated by manufacturer's designations, Match Architect's sample or as selected by Architect from manufacturer's full range.

F. Stone Curbs: Granite curbing, with face battered 1 inch per foot, produced in random lengths not less than 36 inches from granite complying with ASTM C 615.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Cold Spring Granite Inc.
      b. Fletcher Granite Company, Inc.
      c. Granicor, Inc.
      d. New England Stone, LLC.
      e. North Carolina Granite Corporation.
      f. Polycor Inc.
      g. Swenson Granite Co.
      h. Or an Approved Equal.
   2. Granite Color and Grain: Light gray, Dark gray, Buff, White, Black, with fine, medium, and coarse grain.
   3. Top Width: 4 inches, 5 inches, 6 inches.
   4. Face Height: 4 inches, 6 inches, 8 inches.
   5. Total Height: 12 inches, 16 inches, 18 inches.
   6. Top Finish: Sawed, Thermal, Bush hammered.
   7. Face Finish: Split, Sawed, Thermal, Bush hammered.

2.3 ACCESSORIES

A. Cork Joint Filler: Preformed strips complying with ASTM D 1752, Type II.

B. Compressible Foam Filler: Preformed strips complying with ASTM D 1056, Grade 2A1.

2.4 AGGREGATE SETTING-BED MATERIALS

A. Graded Aggregate for Subbase: Sound, crushed stone or gravel complying with ASTM D 448 for Size No. 57, ASTM D 2940, subbase material requirements in Division 31 Section "Earth Moving" for subbase material.

B. Graded Aggregate for Base: Sound, crushed stone or gravel complying with ASTM D 448 for Size No. 8, ASTM D 2940, base material requirements in Division 31 Section "Earth Moving"
for base course.

C. Sand for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C 33 for fine aggregate.

D. Stone Screenings for Leveling Course: Sound stone screenings complying with ASTM D 448 for Size No. 10.

E. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing No. 16 sieve and no more than 10 percent passing No. 200 sieve.
   1. Provide sand of color needed to produce required joint color.

F. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications; made from polyolefins or polyesters, with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
   1. Survivability: Class 2, AASHTO M 288.
   2. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
   3. Permittivity: 0.02 per second, minimum; ASTM D 4491.
   4. UV Stability: 50 percent after 500 hours' exposure, ASTM D 4355.

G. Drainage Geotextile: Nonwoven needle-punched geotextile fabric, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
   1. Survivability: Class 2, AASHTO M 288.
   2. Apparent Opening Size: No. 40 sieve, maximum; ASTM D 4751.
   3. Permittivity: 0.5 per second, minimum; ASTM D 4491.
   4. UV Stability: 50 percent after 500 hours' exposure, ASTM D 4355.

H. Herbicide: Commercial chemical for weed control, registered with the EPA. Provide in granular, liquid, or wettable powder form.

2.5 MORTAR SETTING-BED MATERIALS

A. Regional Materials: Provide aggregate, cement, and lime for mortar that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Portland Cement: ASTM C 150, Type I or Type II.

C. Hydrated Lime: ASTM C 207, Type S.

D. Sand: ASTM C 144.

E. Latex Additive: Acrylic resin water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field- mixed portland cement and aggregate mortar bed, and not containing a retarder.

F. Thinset Mortar: Latex-modified portland cement mortar complying with ANSI A118.4.
   1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Boiardi Products; a QEP company.
      b. Bostik, Inc.
      c. C-Cure.
      d. Custom Building Products.
      e. Jamo Inc.
      f. Laticrete International, Inc.

g. MAPEI Corporation.
h. Mer-Krete System, ParexLahabra, Inc.
i. ProSpec.
j. Southern Grouts & Mortars, Inc.
k. Summitville Tiles, Inc.
l. TEC, Specialty Construction Brands, Inc.
m. Or an Approved Equal.

2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
3. Provide prepackaged, dry-mortar mix combined with acrylic resin liquid-latex additive at Project site.

G. Water: Potable.

H. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2 inches by 0.062 inch in diameter; comply with ASTM A 185/A 185M and ASTM A 82/A 82M except for minimum wire size.

2.6 GROUT MATERIALS

A. Regional Materials: Provide aggregate and cement for grout that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate as required to produce color indicated.
1. Colored Mortar Pigments for Grout: Natural and synthetic iron and chromium oxides, compounded for use in mortar and grout mixes. Use only pigments that have proved, through testing and experience, to be satisfactory for use in portland cement grout.

C. Standard Cement Grout: ANSI A118.6, sanded.
1. Manufacturers: Subject to compliance with requirements, of available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Boiardi Products; a QEP company.
b. Bostik, Inc.
c. C-Cure.
d. Custom Building Products.
e. Jamo Inc.
f. Laticrete International, Inc.
g. MAPEI Corporation.
h. Mer-Krete System, ParexLahabra, Inc.
i. ProSpec.
j. Southern Grouts & Mortars, Inc.
k. Summitville Tiles, Inc.
l. TEC, Specialty Construction Brands, Inc.
m. Or an Approved Equal.

D. Polymer-Modified Tile Grout: ANSI A118.7, sanded.
1. Manufacturers: Subject to compliance with requirements, of available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Boiardi Products; a QEP company.
b. Bostik, Inc.

c. C-Cure.
d. Custom Building Products.
e. Jamo Inc.
f. Laticrete International, Inc.
g. MAPEI Corporation.
h. ProSpec.
i. Southern Grouts & Mortars, Inc.
j. Summitville Tiles, Inc.
k. TEC, Specialty Construction Brands, Inc.
l. Or an Approved Equal.

2. Polymer Type: Ethylene-vinyl acetate or acrylic additive in dry, redispersible form; prepackaged with other dry ingredients.
3. Polymer Type: Acrylic resin in liquid-latex form for addition to prepackaged dry-grout mix.

C. Grout Colors: As indicated by manufacturer's designations, Match Architect's samples, or ss selected by Architect from manufacturer's full range.

D. Water: Potable.

2.7 BITUMINOUS SETTING-BED MIX

A. Mix bituminous setting-bed materials at an asphalt plant in approximate proportion, by weight, of 7 percent asphalt cement to 93 percent fine aggregate unless otherwise indicated. Heat mixture to 300 deg F.

2.8 MORTAR AND GROUT MIXES

A. General: Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing times, and other procedures needed to produce setting-bed and joint materials of uniform quality and with optimum performance characteristics. Discard mortars and grout if they have reached their initial set before being used.

B. Mortar-Bed Bond Coat: Mix neat cement and water to a creamy consistency.

C. Portland Cement-Lime Setting-Bed Mortar: Type M complying with ASTM C 270, Proportion Specification.

D. Latex-Modified, Portland Cement Setting-Bed Mortar: Proportion and mix portland cement, sand, and latex additive for setting bed to comply with written instructions of latex-additive manufacturer and as necessary to produce stiff mixture with a moist surface when bed is ready to receive pavers.

E. Latex-Modified, Portland Cement Bond Coat: Proportion and mix portland cement, aggregate, and liquid latex for bond coat to comply with written instructions of liquid-latex manufacturer.

F. Thinset Mortar Bond Coat: Proportion and mix thinset mortar ingredients according to manufacturer's written instructions.

G. Job-Mixed Portland Cement Grout: Proportion and mix job-mixed portland cement and aggregate grout to match setting-bed mortar except omit hydrated lime and use enough water to produce a pourable mixture.
1. Pigmented Grout: Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1 to 10, by weight.
2. Colored-Aggregate Grout: Produce color required by combining colored aggregates with portland cement of

selected color.

H. Packaged Grout Mix: Proportion and mix grout ingredients according to grout manufacturer's written instructions.

PART 3- EXECUTION

3.1 EXAMINATION

A. Examine areas indicated to receive paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Where pavers are to be installed over waterproofing, examine waterproofing installation, with waterproofing Installer present, for protection from paving operations, including areas where waterproofing system is turned up or flashed against vertical surfaces.

C. Proceed with installation only after unsatisfactory conditions have been corrected and waterproofing protection is in place.

3.2 PREPARATION

A. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.

B. Sweep concrete substrates to remove dirt, dust, debris, and loose particles.

C. Proof-roll prepared subgrade according to requirements in Division 31 Section "Earth Moving" to identify soft pockets and areas of excess yielding. Proceed with unit paver installation only after deficient subgrades have been corrected and are ready to receive subbase and base course for unit pavers.

3.3 INSTALLATION, GENERAL

A. Do not use unit pavers with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in finished work.

B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.

C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
   1. For concrete pavers, a block splitter may be used.

D. Handle protective-coated brick pavers to prevent coated surfaces from contacting backs or edges of other units. If, despite these precautions, coating does contact bonding surfaces of brick, remove coating from bonding surfaces before setting brick.

E. Joint Patter: As indicated or match and continue existing unit paver joint pattern.

F. Pavers over Waterproofing: Exercise care in placing pavers and setting materials over waterproofing so protection materials are not displaced and waterproofing is not punctured or otherwise damaged. Carefully replace protection materials that become displaced and arrange for repair of damaged waterproofing before covering with paving.

1. Provide joint filler at waterproofing that is turned up on vertical surfaces unless otherwise indicated; where unfilled joints are indicated, provide temporary filler or protection until paver installation is complete.

G. Tolerances: Do not exceed 1/32-inch unit-to-unit offset from flush (lippage) nor 1/8 inch in 10 feet from level, or indicated slope, for finished surface of paving.

H. Tolerances: Do not exceed 1/16-inch unit-to-unit offset from flush (lippage) nor 1/8 inch in 24 inches and 1/4 inch in 10 feet from level, or indicated slope, for finished surface of paving.

I. Expansion and Control Joints: Provide for sealant-filled joints at locations and of widths indicated. Provide compressible foam filler as backing for sealant-filled joints unless otherwise indicated; where unfilled joints are indicated, provide temporary filler until paver installation is complete. Install joint filler before setting pavers. Sealant materials and installation are specified in Division 07 Section "Joint Sealants."

J. Expansion and Control Joints: Provide cork joint filler at locations and of widths indicated. Install joint filler before setting pavers. Make top of joint filler flush with top of pavers.

K. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.
1. Install edge restraints to comply with manufacturer's written instructions. Install stakes at intervals required to hold edge restraints in place during and after unit paver installation.
2. For metal edge restraints with top edge exposed, drive stakes at least 1 inch below top edge.
3. Install job-built concrete edge restraints to comply with requirements in Division 03 Section "Cast-in-Place Concrete."
4. Where pavers set in mortar bed are indicated as edge restraints for pavers set in aggregate setting bed, install pavers set in mortar and allow mortar to cure before placing aggregate setting bed and remainder of pavers. Cut off mortar bed at a steep angle so it will not interfere with aggregate setting bed.
5. Where pavers embedded in concrete are indicated as edge restraints for pavers set in aggregate setting bed, install pavers embedded in concrete and allow concrete to cure before placing aggregate setting bed and remainder of pavers. Hold top of concrete below aggregate setting bed.

L. Provide steps made of pavers as indicated. Install paver steps before installing adjacent pavers.
1. Where pavers set in mortar bed are indicated for steps constructed adjacent to pavers set in aggregate setting bed, install steps and allow mortar to cure before placing aggregate setting bed and remainder of pavers. Cut off mortar bed at a steep angle so it will not interfere with aggregate setting bed.

3.4 AGGREGATE SETTING-BED APPLICATIONS

A. Compact soil subgrade uniformly to at least 95 percent of ASTM D 698, ASTM D 1557 laboratory density.

B. Proof-roll prepared subgrade to identify soft pockets and areas of excess yielding. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

C. Place separation geotextile over prepared subgrade, overlapping ends and edges at least 12 inches.
D. Place aggregate subbase and base, compact by tamping with plate vibrator, and screed to depth indicated.

E. Place aggregate subbase and base, compact to 100 percent of ASTM D 1557 maximum laboratory density, and screed to depth indicated.

F. Place drainage geotextile over compacted base course, overlapping ends and edges at least 12 inches.

G. Place leveling course and screed to a thickness of 1 to 1-1/2 inches, taking care that moisture content remains constant and density is loose and uniform until pavers are set and compacted.

H. Treat leveling course with herbicide to inhibit growth of grass and weeds.

I. Set pavers with a minimum joint width of 1/16 inch and a maximum of 1/8 inch, being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch with pieces cut to fit from full-size unit pavers.
    1. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.

J. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf compaction force at 80 to 90 Hz. Use vibrator with neoprene mat on face of plate or other means as needed to prevent cracking and chipping of pavers. Perform at least three passes across paving with vibrator.
    1. Compact pavers when there is sufficient surface to accommodate operation of vibrator, leaving at least 36 inches of uncompacted pavers adjacent to temporary edges.
    2. Before ending each day's work, compact installed concrete pavers except for 36-inch width of uncompacted pavers adjacent to temporary edges (laying faces).
    3. As work progresses to perimeter of installation, compact installed pavers that are adjacent to permanent edges unless they are within 36 inches of laying face.
    4. Before ending each day's work and when rain interrupts work, cover pavers that have not been compacted and cover leveling course on which pavers have not been placed with nonstaining plastic sheets to protect them from rain.

K. Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Vibrate pavers and add sand until joints are completely filled, then remove excess sand. Leave a slight surplus of sand on the surface for joint filling.

L. Do not allow traffic on installed pavers until sand has been vibrated into joints.

M. Repeat joint-filling process 30 days later.

3.5 BITUMINOUS SETTING-BED APPLICATIONS

A. Apply primer to concrete slab or binder course immediately before placing setting bed.

B. Prepare for setting-bed placement by locating 3/4-inch- deep control bars approximately 11 feet apart and parallel to one another, to serve as guides for striking board. Adjust bars to subgrades required for accurate setting of paving units to finished grades indicated.

C. Place bituminous setting bed where indicated, in panels, by spreading bituminous material between control bars. Spread mix at a minimum temperature of 250 deg F. Strike setting bed smooth, firm, even, and not less than 3/4 inch thick. Add fresh bituminous material to low, porous spots after each pass of striking board. After each panel is completed, advance first control bar to next position in readiness for striking adjacent panels. Carefully fill depressions that remain after removing depth-control bars.
    1. Roll setting bed with power roller to a nominal depth of 3/4 inch. Adjust thickness as necessary to allow accurate setting of unit pavers to finished grades indicated. Complete rolling before mix temperature cools

to 185 deg F.

D. Apply neoprene-modified asphalt adhesive to cold setting bed by squeegeeing or troweling to a uniform thickness of 1/16 inch. Proceed with setting of paving units only after adhesive is tacky and surface is dry to touch.

E. Place pavers carefully by hand in straight courses, maintaining accurate alignment and uniform top surface. Protect newly laid pavers with plywood panels on which workers can stand. Advance protective panels as work progresses but maintain protection in areas subject to continued movement of materials and equipment to avoid creating depressions or disrupting alignment of pavers. If additional leveling of paving is required, and before treating joints, roll paving with power roller after sufficient heat has built up in the surface from several days of hot weather.

F. Joint Treatment: Place unit pavers with hand-tight joints. Fill joints by sweeping sand over paved surface until joints are filled. Remove excess sand after joints are fille

3.6 MORTAR SETTING-BED APPLICATIONS

A. Saturate concrete subbase with clean water several hours before placing setting bed. Remove surface water about one hour before placing setting bed.

B. Apply mortar-bed bond coat over surface of concrete subbase about 15 minutes before placing mortar bed. Limit area of bond coat to avoid its drying out before placing setting bed. Do not exceed 1/16-inch thickness for bond coat.

C. Apply mortar bed over bond coat; spread and screed mortar bed to uniform thickness at subgrade elevations required for accurate setting of pavers to finished grades indicated.

D. Place reinforcing wire over concrete subbase, lapped at joints by at least one full mesh and supported so mesh becomes embedded in the middle of mortar bed. Hold edges back from vertical surfaces approximately 1/2 inch.

E. Place mortar bed with reinforcing wire fully embedded in middle of mortar bed. Spread and screed mortar bed to uniform thickness at subgrade elevations required for accurate setting of pavers to finished grades indicated.

F. Mix and place only that amount of mortar bed that can be covered with pavers before initial set. Before placing pavers, cut back, bevel edge, and remove and discard setting-bed material that has reached initial set.

G. Wet brick pavers before laying if the initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

H. Place pavers before initial set of cement occurs. Immediately before placing pavers on mortar bed, apply uniform 1/16-inch- thick bond coat to mortar bed or to back of each paver with a flat trowel.

I. Tamp or beat pavers with a wooden block or rubber mallet to obtain full contact with setting bed and to bring finished surfaces within indicated tolerances. Set each paver in a single operation before initial set of mortar; do not return to areas already set or disturb pavers for purposes of realigning finished surfaces or adjusting joints.

J. Spaced Joint Widths: Provide 3/8-inch, 1/2-inch, 3/4-inch nominal joint width with variations not exceeding plus or minus 1/16 inch, 1/8 inch, 3/16 inch.

K. Grouted Joints: Grout paver joints complying with ANSI A108.10.

L. Grout joints as soon as possible after initial set of setting bed.
   1. Force grout into joints, taking care not to smear grout on adjoining surfaces.
   2. Clean pavers as grouting progresses by dry brushing or rubbing with dry burlap to remove smears before tooling joints.
   3. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
   4. If tooling squeezes grout from joints, remove excess grout and smears by dry brushing or rubbing with dry burlap and tool joints again to produce a uniform appearance.

M. Cure grout by maintaining in a damp condition for seven days unless otherwise recommended by grout or liquid-latex manufacturer.

3.7 REPAIRING, POINTING, AND CLEANING

A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.

B. Pointing: During tooling of joints, enlarge voids or holes and completely fill with grout. Point joints at sealant joints to provide a neat, uniform appearance, properly prepared for sealant application.

C. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.

D. Remove temporary protective coating as recommended by coating manufacturer and as acceptable to paver and grout manufacturers.
   1. Do not allow protective coating to enter floor drains. Trap, collect, and remove coating material.

END OF SECTION 321400

SECTION 329113
SOIL PREPARATION

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Contract Documents apply to this Section.

1.2 SUMMARY

A. Section includes planting soils and layered soil assemblies specified by composition of the mixes.

B. Related Requirements:
   1. Section 329300 "Plants" for placing planting soil for plantings.

1.3 ALLOWANCES

A. Preconstruction and field quality-control testing are part of testing and inspecting allowance.
B.

1.4 DEFINITIONS

A. AAPFCO: Association of American Plant Food Control Officials.

B. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.

C. CEC: Cation exchange capacity.

D. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.

E. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.

F. Imported Soil: Soil that is transported to Project site for use.

G. Layered Soil Assembly: A designed series of planting soils, layered on each other, that together produce an environment for plant growth.

H. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.

I. NAPT: North American Proficiency Testing Program. An SSSA program to assist soil-, plant-, and water-testing laboratories through interlaboratory sample exchanges and statistical evaluation of analytical data.

J. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."

K. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

L. RCRA Metals: Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.

M. SSSA: Soil Science Society of America.

N. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

O. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

P. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.

Q. USCC: U.S. Composting Council.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include recommendations for application and use.
   2. Include test data substantiating that products comply with requirements.
   3. Include sieve analyses for aggregate materials.
   4. Material Certificates: For each type of imported soil and/ or soil amendment and fertilizer before delivery to the site, according to the following:
      a. Manufacturer's qualified testing agency's certified analysis of standard products.
      b. Analysis of fertilizers, by a qualified testing agency, made according to AAPFCO methods for testing and labeling and according to AAPFCO's SUIP #25.
      c. Analysis of nonstandard materials, by a qualified testing agency, made according to SSSA methods, where applicable.

B. Samples: For each bulk-supplied material, 1-quart (1-L) volume of each in sealed containers labeled with content, source, and date obtained. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of composition, color, and texture.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For each testing agency.

B. Preconstruction Test Reports: For preconstruction soil analyses specified in "Preconstruction Testing" Article.

C. Field quality-control reports.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.
   1. Laboratories: Subject to compliance with requirements, provide testing laboratory for preapproval by the Landscape Architect.
   2. Multiple Laboratories: At Contractor's option, work may be divided among qualified testing laboratories specializing in physical testing, chemical testing, and fertility testing.

1.9 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction soil analyses on existing, on-site soil and/ or imported soil.
   1. Notify Landscape Architect seven days in advance of the dates and times when laboratory samples will be taken.

B. Preconstruction Soil Analyses: For each unamended soil type, perform testing on soil samples and furnish soil analysis and a written report containing soil-amendment and fertilizer recommendations by a qualified testing agency performing the testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.
   1. Have testing agency identify and label samples and test reports according to sample collection and labeling requirements.

1.10 SOIL-SAMPLING REQUIREMENTS

A. General: Extract soil samples according to requirements in this article.

B. Sample Collection and Labeling: Have samples taken and labeled by state-certified, licensed, or registered soil scientist in presence of Landscape Architect under the direction of the testing agency.
   1. Number and Location of Samples: Shall be representative soil samples from where indicated on Drawings or where directed by Landscape Architect for each soil to be used or amended for landscaping purposes.
   2. Procedures and Depth of Samples: According to USDA-NRCS's "Field Book for Describing and Sampling Soils." and as directed by Landscape Architect.
   3. Division of Samples: Split each sample into two, equal parts. Send half to the testing agency and half to Owner for its records.
   4. Labeling: Label each sample with the date, location keyed to a site plan or other location system, visible soil condition, and sampling depth.

1.11 TESTING REQUIREMENTS

A. General: Perform tests on soil samples according to requirements in this article.

B. Physical Testing:

1. Soil Texture: Soil-particle, size-distribution analysis by one of the following methods according to SSSA's "Methods of Soil Analysis- Part 1-Physical and Mineralogical Methods":
   a. Sieving Method: Report sand-gradation percentages for very coarse, coarse, medium, fine, and very fine sand; and fragment-gradation (gravel) percentages for fine, medium, and coarse fragments; according to USDA sand and fragment sizes.
   b. Hydrometer Method: Report percentages of sand, silt, and clay.
2. Total Porosity: Calculate using particle density and bulk density according to SSSA's "Methods of Soil Analysis- Part 1-Physical and Mineralogical Methods."
3. Water Retention: According to SSSA's "Methods of Soil Analysis- Part 1-Physical and Mineralogical Methods."
4. Saturated Hydraulic Conductivity: According to SSSA's "Methods of Soil Analysis- Part 1-Physical and Mineralogical Methods"; at 85% compaction according to ASTM D 698 (Standard Proctor).

C. Chemical Testing:
   1. CEC: Analysis by sodium saturation at pH 7 according to SSSA's "Methods of Soil Analysis- Part 3- Chemical Methods."
   2. Clay Mineralogy: Analysis and estimated percentage of expandable clay minerals using CEC by ammonium saturation at pH 7 according to SSSA's "Methods of Soil Analysis- Part 1- Physical and Mineralogical Methods."
   3. Metals Hazardous to Human Health: Test for presence and quantities of RCRA metals including aluminum, arsenic, barium, copper, cadmium, chromium, cobalt, lead, lithium, and vanadium. If RCRA metals are present, include recommendations for corrective action.
   4. Phytotoxicity: Test for plant-available concentrations of phytotoxic minerals including aluminum, arsenic, barium, cadmium, chlorides, chromium, cobalt, copper, lead, lithium, mercury, nickel, selenium, silver, sodium, strontium, tin, titanium, vanadium, and zinc.

D. Fertility Testing: Soil-fertility analysis according to standard laboratory protocol of SSSA NAPT NCR-13, SSSA NAPT NEC-67, SSSA NAPT SERA-6, and SSSA NAPT WERA-103, including the following:
   1. Percentage of organic matter.
   2. CEC, calcium percent of CEC, and magnesium percent of CEC.
   3. Soil reaction (acidity/alkalinity pH value).
   4. Buffered acidity or alkalinity.
   5. Nitrogen ppm.
   6. Phosphorous ppm.
   7. Potassium ppm.
   8. Manganese ppm.
   9. Manganese-availability ppm.
   10. Zinc ppm.
   11. Zinc availability ppm.
   12. Copper ppm.
   13. Sodium ppm and sodium absorption ratio.
   14. Soluble-salts ppm.
   15. Presence and quantities of problem materials including salts and metals cited in the Standard protocol. If such problem materials are present, provide additional recommendations for corrective action.
   16. Other deleterious materials, including their characteristics and content of each.

E. Organic-Matter Content: Analysis using loss-by-ignition method according to SSSA's "Methods of Soil Analysis- Part 3- Chemical Methods."

F. Recommendations: Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated to produce satisfactory planting soil suitable for healthy, viable plants indicated. Include, at a minimum, recommendations for nitrogen, phosphorous, and potassium fertilization, and for micronutrients.
   1. Fertilizers and Soil Amendment Rates: State recommendations in weight per 1000 sq. ft. (100 sq. m) for 6-inch (150-mm) depth of soil.
   2. Soil Reaction: State the recommended liming rates for raising pH or sulfur for lowering pH according to the buffered acidity or buffered alkalinity in weight per 1000 sq. ft. (100 sq. m) for 6-inch (150-mm) depth of soil.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.

B. Bulk Materials:
   1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
   2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
   3. Do not move or handle materials when they are wet or frozen.
   4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

PART 2- PRODUCTS

2.1 PLANTING SOILS SPECIFIED BY COMPOSITION

A. General: Soil amendments, fertilizers, and rates of application specified in this article are guidelines that may need revision based on testing laboratory's recommendations after preconstruction soil analyses are performed.

B. Planting-Soil Type Existing, on-site surface soil, with the duff layer, if any, retained; and stockpiled on-site; modified to produce viable planting soil. Blend existing, on-site surface soil with the following soil amendments and fertilizers in the following quantities to produce planting soil:
   1. Ratio of Loose Compost to Soil: Ratio by volume as recommended by soil report and approved by Landscape Architect.
   2. Ratio of Loose Peat to Soil: Ratio by volume as recommended by soil report and approved by Landscape Architect.
   3. Ratio of Loose Wood Derivatives Soil: Ratio by volume as recommended by soil report and approved by Landscape Architect.

4. Weight of Lime: Ratio by volume as recommended by soil report and approved by Landscape Architect per 6 inches (150 mm) of soil depth.
5. Weight of Sulfur or Iron Sulfate: Ratio by volume as recommended by soil report and approved by Landscape Architect per 6 inches (150 mm) of soil depth.
6. Weight of Agricultural Gypsum: Ratio by volume as recommended by soil report and approved by Landscape Architect per 6 inches (150 mm) of soil depth.
7. Weight of Superphosphate: Ratio by volume as recommended by soil report and approved by Landscape Architect per 6 inches (150 mm) of soil depth.
8. Weight of Commercial Fertilizer: Ratio by volume as recommended by soil report and approved by Landscape Architect per 6 inches (150 mm) of soil depth.
9. Weight of Slow-Release Fertilizer: Ratio by volume as recommended by soil report and approved by Landscape Architect per 6 inches (150 mm) of soil depth.

C. Planting-Soil Type: Imported, naturally formed soil from off-site sources and consisting of sandy loam, loam, silt loam, loamy sand or sand soil according to USDA textures; and modified to produce viable planting soil.
   1. Sources: Take imported, unamended soil from sources that are naturally well-drained sites where topsoil occurs at least 4 inches (100 mm) deep, not from agricultural land, bogs, or marshes; and that do not contain undesirable organisms; disease-causing plant pathogens; or obnoxious weeds and invasive plants including, but not limited to, quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and bromegrass.
   2. Additional Properties of Imported Soil before Amending: Soil reaction of pH 6 to 7 and minimum of 2 percent organic-matter content, friable, and with sufficient structure to give good tilth and aeration.
   3. Unacceptable Properties: Clean soil of the following:
      a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
      b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 8 percent by dry weight of the imported soil.
      c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 2 inches (50 mm) in any dimension.
   4. Amended Soil Composition: Blend imported, unamended soil with the following soil amendments and fertilizers in the following quantities to produce planting soil:
      a. Ratio of Loose Compost to Soil: Ratio by volume as recommended by soil report and approved by Landscape Architect.
      b. Ratio of Loose Peat to Soil: Ratio by volume as recommended by soil report and approved by Landscape Architect.
      c. Ratio of Loose Wood Derivatives to Soil: Ratio by volume as recommended by soil report and approved by Landscape Architect.
      d. Weight of Lime: Ratio by volume as recommended by soil report and approved by Landscape Architect per 6 inches (150 mm) of soil depth.
      e. Weight of Sulfur or Iron Sulfate: Ratio by volume as recommended by soil report and approved by Landscape Architect per 6 inches (150 mm) of soil depth.
      f. Weight of Agricultural Gypsum: Ratio by volume as recommended by soil report and approved by Landscape Architect per 6 inches (150 mm) of soil depth.
      g. Weight of Superphosphate: Ratio by volume as recommended by soil report and

approved by Landscape Architect per 6 inches (150 mm) of soil depth.

h. Weight of Commercial Fertilizer: Ratio by volume as recommended by soil report and approved by Landscape Architect per 6 inches (150 mm) of soil depth.

i. Weight of Slow-Release Fertilizer: Ratio by volume as recommended by soil report and approved by Landscape Architect per 6 inches (150 mm) of soil depth.

D. Planting-Soil Type: Manufactured soil consisting of manufacturer's basic topsoil, sandy loam according to USDA textures, blended in a manufacturing facility with sand, stabilized organic soil amendments, and other materials to produce viable planting soil.

1. Double click here to find, evaluate, and insert list of manufacturers and products.
2. Additional Properties of Manufacturer's Basic Soil before Amending: Soil reaction of pH 6 to 7 and minimum of 2 percent organic-matter content, friable, and with sufficient structure to give good tilth and aeration.
3. Unacceptable Properties: Manufactured soil shall not contain the following:
   a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
   b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 5 percent by dry weight of the manufactured soil.
   c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 1 inch (25 mm) in any dimension.
4. Blend manufacturer's basic soil with the following soil amendments and fertilizers in the following quantities to produce planting soil:
   a. Ratio of Loose Compost to Soil: Ratio by volume as recommended by soil report and approved by Landscape Architect.
   b. Ratio of Loose Peat to Soil: Ratio by volume as recommended by soil report and approved by Landscape Architect.
   c. Ratio of Loose Wood Derivatives Soil: Ratio by volume as recommended by soil report and approved by Landscape Architect.
   d. Volume of Sand: Volume per cu. yd. (cu. m) as recommended by soil report and approved by Landscape Architect.
   e. Volume of Perlite: Volume per cu. yd. (cu. m) as recommended by soil report and approved by Landscape Architect.
   f. Weight of Lime: Weight per cu. yd. (cu. m) as recommended by soil report and approved by Landscape Architect.
   g. Weight of Sulfur or Iron Sulfate: Weight per cu. yd. (cu. m) as recommended by soil report and approved by Landscape Architect.
   h. Weight of Agricultural Gypsum: Weight per cu. yd. (cu. m) as recommended by soil report and approved by Landscape Architect.
   i. Weight of Superphosphate: Weight per cu. yd. (cu. m) as recommended by soil report and approved by Landscape Architect.
   j. Weight of Commercial Fertilizer: Weight per cu. yd. (cu. m) as recommended by soil report and approved by Landscape Architect.
   k. Weight of Slow-Release Fertilizer: Weight per cu. yd. (cu. m) as recommended by soil report and approved by Landscape Architect.

2.2 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
   1. Class: T, with a minimum of 99 percent passing through a No. 8 (2.36-mm) sieve and a minimum of 75 percent passing through a No. 60 (0.25-mm) sieve.
   2. Class: O, with a minimum of 95 percent passing through a No. 8 (2.36-mm) sieve and a minimum of 55 percent passing through a No. 60 (0.25-mm) sieve.
   3. Form: Provide lime in form of either ground dolomitic limestone, calcitic limestone, or mollusk shells, as recommended by soil report and approved by Landscape Architect.

B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through a No. 40 (0.425-mm) sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Perlite: Horticultural perlite, soil amendment grade.

E. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through a No. 50 (0.30-mm) sieve.

F. Sand: Clean, washed, natural or manufactured, free of toxic materials, and according to ASTM C 33/C 33M.

2.3 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter produced by composting feedstock, and bearing USCC's "Seal of Testing Assurance," and as follows:
   1. Feedstock: Limited to leaves. May include sewage sludge and/ or animal waste if recommended by soil report and approved by Landscape Architect.
   2. Reaction: pH of 5.5 to 8.
   3. Soluble-Salt Concentration: Less than 4 dS/m.
   4. Moisture Content: 35 to 55 percent by weight.
   5. Organic-Matter Content: 30 to 40 percent of dry weight.
   6. Particle Size: Minimum of 98 percent passing through 1/2-inch (13-mm) sieve.

B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture with 100 percent passing through a 1/2-inch (13-mm) sieve, a pH of 3.4 to 4.8, and a soluble-salt content measured by electrical conductivity of maximum 5 dS/m.

C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat finely divided or of granular texture with 100 percent passing through a 1/2-inch (13-mm) sieve, a pH of 6 to 7.5, a soluble-salt content measured by electrical conductivity of maximum 5 dS/m, having a water-absorbing capacity of 1100 to 2000 percent, and containing no sand.

D. Wood Derivatives: Shredded and composted, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.

1. Partially Decomposed Wood Derivatives: In lieu of shredded and composted wood derivatives, mix shredded and partially decomposed wood derivatives with ammonium nitrate at a minimum rate of 0.15 lb/cu. ft. (2.4 kg/cu. m) of loose sawdust or ground bark, or with ammonium sulfate at a minimum rate of 0.25 lb/cu. ft. (4 kg/cu. m) of loose sawdust or ground bark.

E. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

2.4 FERTILIZERS

A. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of [**20**] [**33**] [**50**] percent available phosphoric acid.

B. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
1. Composition: 1 lb/1000 sq. ft. (0.5 kg/100 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.

C. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.

D. Chelated Iron: Commercial-grade FeEDDHA for dicots and woody plants, and commercial-grade FeDTPA for ornamental grasses and monocots.

PART 3- EXECUTION

3.1 GENERAL

A. Place planting soil and fertilizers according to requirements in other Specification Sections.

B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.

C. Proceed with placement only after unsatisfactory conditions have been corrected.

3.2 PREPARATION OF UNAMENDED, ON-SITE SOIL BEFORE AMENDING

A. Excavation: Excavate soil from designated area(s) to a depth shown on the Drawings or as directed by the

Landscape Architect and stockpile until amended.

B. Unacceptable Materials: Clean soil of concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.

C. Unsuitable Materials: Clean soil to contain a maximum of 8 percent by dry weight of stones, roots, plants, sod, clay lumps, and pockets of coarse sand.

D. Screening: Pass unamended soil through a 2-inch (50-mm) sieve to remove large materials.

3.3 PLACING AND MIXING PLANTING SOIL OVER EXPOSED SUBGRADE

A. General: Apply and mix unamended soil with amendments on-site to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Subgrade Preparation: Till subgrade to a minimum depth of 8 inches (200 mm). Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off DCAS's property.
   1. Apply, add soil amendments, and mix approximately half the thickness of unamended soil over prepared, loosened subgrade according to "Mixing" Paragraph below. Mix thoroughly into top 2 inches (50 mm) of subgrade. Spread remainder of planting soil.

C. Mixing: Spread unamended soil to total depth indicated on Drawings, but not less than required to meet finish grades after mixing with amendments and natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.
   1. Amendments: Apply soil amendments and fertilizer, if required, evenly on surface, and thoroughly blend them with unamended soil to produce planting soil.
      a. Mix lime and/ or sulfur with dry soil before mixing fertilizer as recommended by soil report.
      b. Mix fertilizer with planting soil no more than seven days before planting.
   2. Lifts: Apply and mix unamended soil and amendments in lifts not exceeding 8 inches (200 mm) in loose depth for material compacted by compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

D. Compaction: Compact each blended lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698 and tested in-place except where a different compaction value is indicated on Drawings.

E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.4 PLACING MANUFACTURED PLANTING SOIL OVER EXPOSED SUBGRADE

A. General: Apply manufactured soil on-site in its final, blended condition. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Subgrade Preparation: Till subgrade to a minimum depth of 8 inches (200 mm). Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off DCAS's property.
   1. Apply approximately half the thickness of planting soil over prepared, loosened subgrade. Mix thoroughly into top 2 inches (50 mm) of subgrade. Spread remainder of planting soil.

C. Application: Spread planting soil to total depth indicated on Drawings, but not less than required to meet finish grades after natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.
   1. Lifts: Apply planting soil in lifts not exceeding 8 inches (200 mm) in loose depth for material compacted by compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

D. Compaction: Compact each lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698 except where a different compaction value is indicated on Drawings.

E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.5 BLENDING PLANTING SOIL IN PLACE

A. General: Mix amendments with in-place, unamended soil to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Preparation: Till unamended, existing soil in planting areas to a minimum depth 8 inches (200m). Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

C. Mixing: Apply soil amendments and fertilizer, if required, evenly on surface, and thoroughly blend them into full depth of unamended, in-place soil to produce planting soil.
   1. Mix lime and/ or sulfur with dry soil before mixing fertilizer as recommended by soil report.
   2. Mix fertilizer with planting soil no more than seven days before planting.

D. Compaction: Compact blended planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698 except where a different compaction value is indicated on Drawings.

E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.6 APPLYING COMPOST TO SURFACE OF PLANTING SOIL

A. Application: Apply compost component of planting-soil mix, depth as recommended by soil report, to surface of in-place planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Finish Grading: Grade surface to a smooth, uniform surface plane with loose, uniformly fine

texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.7 LAYERED SOIL ASSEMBLIES

A. Layered Soil Assembly:
   1. Top Layer: Planting-soil type indicated on drawing.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests:
   1. Compaction: Test planting-soil compaction after placing each lift and at completion using a densitometer or soil-compaction meter calibrated to a reference test value based on laboratory testing according to ASTM D 698. Space tests at no less than one for each 1000 sq. ft. (100 sq. m)] of in-place soil or part thereof.

C. Soil will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Label each sample and test report with the date, location keyed to a site plan or other location system, visible conditions when and where sample was taken, and sampling depth.

3.9 PROTECTION

A. Protection Zone: Identify protection zones according to Section 015639 "Temporary Tree and Plant Protection."

B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:
   1. Storage of construction materials, debris, or excavated material.
   2. Parking vehicles or equipment.
   3. Vehicle traffic.
   4. Foot traffic.
   5. Erection of sheds or structures.
   6. Impoundment of water.
   7. Excavation or other digging unless otherwise indicated.

C. If planting soil or subgrade is overcompacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the planting soil and contamination; restore the subgrade as directed by Architect and replace contaminated planting soil with new planting soil.

3.10 CLEANING

A. Protect areas adjacent to planting-soil preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.

B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off DCAS's property unless otherwise indicated.
   1. Dispose of excess subsoil and unsuitable materials onsite where directed by DCAS.

END OF SECTION 329113

SECTION 329300
PLANTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Contract Documents apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Plants.
2. Tree stabilization.
3. Tree-watering devices.
4. Landscape edgings.
5. Tree grates.

1.3 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with a ball size diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required.

D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than the minimum root spread according to ANSI Z60.1 for type and size of plant required.

E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well- established root system reaching sides of container and maintaining a firm ball

when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

F. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.

G. Finish Grade: Elevation of finished surface of planting soil.

H. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.

I. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

J. Planting Area: Areas to be planted.

K. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329113 "Soil Preparation", Section 329115 "Soil Preparation (Performance Specification)" for drawing designations for planting soils.

L. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.

M. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

N. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.

O. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 ABBREVIATIONS

A. The following abbreviations are used in this Section regarding plant material:

- CY- Cubic yard
- Cal. – indicates the caliper of the trunk of the tree.
- B.R. – indicates the plants to be dug with bare roots.
- B&B – indicates plants to be balled and burlapped.
- B&P – indicates plants to be balled and platformed.
- C.G. – indicated container-grown plants.

B. Organizations referred to by abbreviation in these Specifications are as follows:

- ASA American Society of Agronomy.
- AAN American Association of Nurserymen. ANSI American National Standards Institute.

1.5 ACTION SUBMITTALS

A. Before any work is commenced, all submittals shall be approved.

B. Product Data: For each type of product.

1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.

2. Plant Photographs: Include color photographs in digital and 3- by 5-inch (76- by

127-mm) print formats of each required species and size of plant material as it will be furnished to Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than 20 plants are required, include a minimum of three photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the

full scientific name of the plant, plant size, and name of the growing nursery.

C. Samples for Verification: For each of the following:

1. Trees and Shrubs: One sample of each variety and size delivered to site for review.

Maintain approved Samples on-site as a standard for comparison.

2. Organic Compost Mulch: 1-quart (1-L) volume of each organic mulch required; in

sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.

3. Mineral Mulch: 2 lb. (1.0 kg) or 5 lb. (2.5 kg) of each mineral mulch required, in

sealed plastic bags labeled with source of mulch. Sample shall be typical of the lot of material to be delivered and installed on-site; provide an accurate indication of color, texture, and makeup of the material.

4. Proprietary Root-Ball-Stabilization Device: One unit.

5. Slow-Release, Tree-Watering Device: One unit of each size required.

6. Edging Materials and Accessories: Manufacturer's standard size, to verify color

selected.

7. Tree Grates, Frames and Accessories: Manufacturer's standard size delivered to site for review, to verify design and color selected.

8. Root Barrier: Width of panel by 12 inches (300 mm).

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.

B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:

1. Manufacturer's certified analysis of standard products.

2. Analysis of other materials by a recognized laboratory made according to methods

established by the Association of Official Analytical Chemists, where applicable.

C. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

C. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established to DCAS for maintenance of plants during a calendar year. Submit before expiration of required maintenance periods.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.

1. Professional Membership: Installer shall be a member in good standing of either the
Professional Landcare Network or the American Nursery and Landscape
Association.
2. Experience: Three years' experience in landscape installation
3. Installer's Field Supervision: Require Installer to maintain an experienced full-time
supervisor on Project site when work is in progress.
4. Personnel Certifications: Installer's supervisor assigned to the Work shall have
certification in one of the following categories from the Professional Landcare Network:
a. Landscape Industry Certified Technician- Exterior.
b. Landscape Industry Certified Horticultural Technician.
5. Pesticide Applicator: State licensed, commercial.

B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

1. Selection of plants purchased under allowances is made by Lanscape Architect, who
tags plants at their place of growth before they are prepared for transplanting.

C. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.

1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container-grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches (150 mm) above the root flare for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above the root flare for larger sizes.

2. Other Plants: Measure with stems, petioles, and foliage in their normal position.

D. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify Landscape Architect of sources of planting materials seven days in advance of delivery to site.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

3. Accompany each delivery of bulk materials with appropriate certificates.

C. Deliver bare-root stock plants within 24 hours of digging. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting. Transport in covered, temperature-controlled vehicles, and keep plants always cool and protected from sun and wind.

D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

E. Handle planting stock by root ball.

F. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg. F (16 to 18 deg. C) until planting.

G. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at
nursery before moving and again two weeks after planting.

H. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

I. Deliver plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1. Heel-in bare-root stock. Soak roots that are in less than moist condition in water for two hours. Reject plants with dry roots.
2. Set balled stock on ground and cover ball with soil, peat

moss, sawdust, or other acceptable material.

3. Do not remove container-grown stock from containers before time of planting.
4. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.10 FIELD CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. Spring Planting:
a. Deciduous and Evergreen B&B March 1st to May 15th.
b. Deciduous and Evergreen Cont. March 1st to May 31.
2. Fall Planting:
a. Evergreen B&B August 15th to October 31st.
b. Deciduous B&B October 1st to December 15th.
c. Evergreen & Deciduous Cont. August 15th to December 15th.

C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:
a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by DCAS.

b. Structural failures including plantings falling or blowing over.

c. Faulty performance of tree stabilization, edgings, tree grates, etc.

d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Periods: From date of acceptance of planting maintenance by DCAS.

a. Trees, Shrubs, Vines, and Ornamental Grasses: 24 months.

b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.

c. Annuals: 3 months.

1. Include the following remedial actions as a minimum:

a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.

b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.

c. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.

d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

PART 2 – MATERIALS

2.1 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch (19 mm) in diameter; or with stem girdling roots are unacceptable.
2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Landscape Architect, with a proportionate increase in size of roots or balls.

C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

D. Labeling: Label each plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant.

E. If formal arrangements or consecutive order of plants is indicated on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

F. Annuals and Biennials: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery and that are in bud but not yet in bloom.

2.2 FERTILIZERS

A. Planting Tablets: Tightly compressed chip-type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.
   1. Size: 5-gram (quart size or smaller C.T.), 10-gram (quart to gallon size C.T.) 21-
      gram (tree/shrub C.T. size) tablets.
   2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent
      potassium, by weight plus micronutrients.

B. Superphosphate: Superphosphate (18-20% phosphorous acid) shall be incorporated with
   the topsoil at the time of planting, at the following rates:
   1. Two (2) pounds per 1” of caliper of tree.
   2. One (1) pound per two (2) feet height of shrub.
   3. Twenty (20) pounds per 1,000 square feet of ground

cover bed.

2.3 MULCHES

A. Retain one or more of "Organic Mulch," "Compost Mulch," and "Mineral Mulch" paragraphs below. Indicate function and location of each material on Drawings.

B. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Type: Shredded hardwood.
2. Size Range: 1/8 inch nominal thickness with 50% having an area of not less than 1 square inch nor more than 6 square inches.
3. Color: Natural.

C. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through a 1-inch (25-mm) sieve; soluble- salt content of 2 to 5 dS/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight.
2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source- separated or compostable mixed solid waste.

D. Mineral Mulch: Hard, durable stone, washed free of loam, sand, clay, and other foreign substances, of the following type, size range, and color:

1. Type: Rounded riverbed gravel or smooth-faced stone, crushed stone or gravel, marble chips, granite chips or as otherwise indicated on the Drawings.

2. Size Range: 1-1/2 inches (38 mm) maximum, 1/4 inch (6.4 mm) minimum or as otherwise indicated on the Drawings.

3. Color: Uniform tan-beige color or readily available natural gravel color range or as otherwise indicated on the Drawings.

2.4 PESTICIDES

A. General: Pesticide registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

1. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

2. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

2.5 TREE-STABILIZATION MATERIALS

A. Trunk-Stabilization Materials:

1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal (38-by-38-mm actual) by length indicated, pointed at one end.

2. Wood Deadmen: Timbers measuring 8 inches (200 mm) in diameter and 48 inches (1200 mm) long, treated with specified wood pressure-preservative treatment.

3. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes, turnbuckles or compression springs.

4. Guys and Tie Wires: ASTM A 641/A 641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch (2.7 mm) in diameter.

5. Tree-Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.

6. Guy Cables: Five-strand, 3/16-inch- (4.8-mm-) diameter, galvanized-steel cable, with zinc- coated turnbuckles or compression springs, a minimum of 3 inches (75 mm) long, with two 3/8-inch (10-mm) galvanized eyebolts.

7. Flags: Standard surveyor's plastic flagging tape, white, 6 inches (150 mm) long.

8. Proprietary Staking-and-Guying Devices: Proprietary stake or anchor and adjustable tie systems to secure each new planting by plant stem; sized as indicated and according to manufacturer's written recommendations.

B. Root-Ball Stabilization Materials:

1. Upright Stakes and Horizontal Hold-Down: Rough-sawn, sound, new hardwood or softwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal (38-by- 38-mm actual) by length indicated; stakes pointed at one end.
2. Wood Screws: ASME B18.6.1.
3. Proprietary Root-Ball Stabilization Devices: Proprietary at- or below-grade stabilization systems to secure each new planting by root ball and that do not encircle the trunk; sized according to manufacturer's written recommendations unless otherwise indicated.

2.6 LANDSCAPE EDGINGS

A. Wood Edging: Of sizes indicated on Drawings, and wood stakes as follows:
1. Species: Western red cedar, all heart.
2. Stakes: Same species as edging, 1-by-2-inch nominal (19-by-38-mm actual) by 18 inches (450 mm) long, with galvanized nails for anchoring edging.

B. Steel Edging: Standard commercial-steel edging, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes.
1. Edging Size: As shown on drawings.
2. Stakes: Tapered steel, a minimum of 12 inches (300 mm) long.
3. Accessories: Standard tapered ends, corners, and splicers.
4. Finish: Zinc coated.
a. Paint Color: Black.

C. Aluminum Edging: Standard-profile extruded-aluminum edging, ASTM B 221 (ASTM B 221M), Alloy 6063-T6, fabricated in standard lengths with interlocking sections with loops stamped from face of sections to receive stakes.
1. As shown on the drawings.
2. Stakes: Aluminum, ASTM B 221 (ASTM B 221M), Alloy 6061-T6, approximately 1-1/2 inches (38 mm) wide by 12 inches (300 mm) long.
3. Finish: Black anodized.
a. Paint Color: Black.

D. Plastic Edging: Standard black polyethylene or vinyl edging, V-lipped bottom or horizontally grooved, extruded in standard lengths, with 9-inch (225-mm) steel angle stakes.

1. Edging Size: [0.1 inch (2.5 mm) thick by 5 inches (125 mm) deep].

2. Top Profile: Straight, with top 2 inches (50 mm) being 1/4 inch (6.4 mm) thick.

3. Top Profile: Round top, 1 inch (25 mm) in diameter.

4. Accessories: Manufacturer's standard alignment clips or plugs.

2.7 TREE GRATES

A. Tree Grates: Manufacturer's standard or custom designed tree grates and frames].

1. Grates: ASTM A 48/A 48M, Class 35 or better, gray-iron castings.

2. Frames:[ASTM A 48/A 48M, Class 35 or better, gray-iron castings] or

[ASTM A 36/A 36M steel-angle, hot-dip galvanized,] of shape, pattern, and size indicated.

B. Shape and Size: As indicated on drawings.

C. Finish: Powder-coat finish.

1. Color: Low-gloss <Insert color>.

2.8 TREE-WATERING DEVICES

A. Watering Pipe: PVC pipe 4 inches (100 mm) in diameter, site-cut to length as required, and with snug-fitting removable cap.

B. Slow-Release Watering Device: Standard product manufactured for drip irrigation of plants and emptying its water contents over an extended time period; manufactured from UV-light-stabilized nylon-reinforced polyethylene sheet, PVC, or HDPE plastic.

2.9 MISCELLANEOUS PRODUCTS

A. Wood Pressure-Preservative Treatment: AWPA U1, Use Category UC4a; acceptable to authorities having jurisdiction, and containing no arsenic or chromium.

B. Root Barrier: Black, molded, modular panels 18 inches (457 mm) or 24 inches (610 mm) high (deep), 85 mils (2.2 mm) thick, and with vertical root deflecting ribs protruding 3/4 inch (19 mm) out from panel surface; manufactured with minimum 50 percent recycled polyethylene plastic with UV inhibitors.

C. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.

D. Burlap: Non-synthetic, biodegradable.

E. Planter Drainage Gravel: Washed, sound crushed stone or gravel complying with ASTM D 448 for Size No. 8.

F. Planter Filter Fabric: Woven and Nonwoven geotextile manufactured for separation applications and made of polypropylene, polyolefin, or polyester fibers or combination of them.

G. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb. (0.45 kg) of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb. (0.45 kg) of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material

2.10 SOIL MIXTURE

Shrubs

Required Mixture- Parts by Volume**

Top Classification By Clay Content	Top Soil	Sand	Peat	Fertilizer *	Lime *
Clay 5-10%	4	1	1	(1/2) lb./cy	(1) lb./cy
Clay 10-15%	2	2	1	(1/2) lb./cy	(1) lb./cy
Clay 15-25%	2	3	1 to 1-1/2	(1/2) lb./cy	(1) lb./cy

*Adjust in accordance with Chemical Analysis Report.
**Adjust in accordance with Mechanical Analysis Report.

A. Topsoil: Natural, fertile, friable soil, representative of local productive soil, and 90% free of clay lumps, subsoil or other foreign matter larger than one inch diameter; not frozen or muddy. Acidity range pH 6 to 7, not less than 3% organic matter as determined by loss oh ignition of moisture free samples dried at 105 degrees Centigrade: not more than 60% by volume passing the No. 200 sieve.

B. Sand: Clean, coarse, graded 1-2 mm, meeting the requirements of ASA for fine aggregate.

C. Peat: A natural residue formed by decomposition of reeds, sedges or mosses from a fresh water site, free from lumps, roots and stones, absorbing at least 4 times its dry weight of water, organic matter not less than 90% on a dry weight basis. The maximum moisture content at the time of delivery shall be 6.5% by weight.

D. Lime: Ground dolomitic limestone not less than 85% total carbonates and magnesium, ground so that 50% passes 100 mesh sieve and 90% 20 mesh sieve. Coarser material will be acceptable provided the specified rates of application are increased proportionately on the basis of quantities passing the 100 mesh sieve.

E. Fertilizer: A commercial fertilizer containing 5% nitrogen, 10% available phosphoric acid and 5%, potash unless soil tests indicate need for different composition. Conform to applicable state fertilizer laws and standards of AOAC, uniform in composition, dry, free flowing and delivered in original, unopened containers bearing manufacturer’s guaranteed analysis.

F. Root Enhancer: Root growth enhancer as manufactured by Roots. Inc. 25 Science Park, New Haven, CT 06511; Tel. (203) 786-5295; Fax (203) 786-5297.; or an Approved Equal

2.11 ORGANIC MULCH

A. Shredded Pine Park mulch as approved by the Landscape Architect; or an approved equal.

2.12 CHEMICAL INHIBITORS

A. Anti-desiccant: Shall be an emulsion which will produce a protective film over plant surfaces; permeable enough to permit transpiration such as “Wilt-Pruf”, manufactured by Nursery Products Specialties Co. Croton Falls, New York, or an Approved Equal. It shall be delivered in the containers of the manufacturer and mixed on site.

B. Selective Herbicide: A municipality approved medium developed specifically to kill herbaceous weeds arid seedlings. Herbicides shall be applied strictly in accordance with manufacturer’s recommendations and application instruction.

C. Pre-emergent Herbicide: A municipality approved medium developed specifically for pre- emergent control of herbaceous weeds and seedlings. Herbicide shall be applied strictly in accordance with manufacturer’s recommendations.

D. Fungicides: Municipality approved medium specifically developed to combat the growth of fungi on plant materials and in planting soil media. Fungicide shall be applied strictly in accordance with manufacturer’s recommendations and application rates.

2.13 PLANT MATERIALS

A. Nomenclature: Names of plants required under this Contract conform to those given in Hortus Third 1976 or Hortus Second 1972 by L.H. Bailey. Names of varieties not included there shall conform with names generally accepted in the nursery trade.

B. Plant schedule: Refer to drawings.

C. Quality and Size: Nursery grown, habit of growth that is normal for the species, sound, healthy, vigorous and free from insects, diseases, and injuries. Equal to or exceeding measurements specified in plant list. Plants measured before pruning with branches in normal position; necessary pruning done at time of planting. Sizes and methods of handling according to the code of standards recommended by the AAN.

2.14 MINOR MATERIALS

A. Accessories or other materials not described but required for completed work shall conform to commonly accepted

industry standards and shall be of types and sizes best suited for the intended purpose and related conditions.

PART 3- EXECUTION

3.1 EXAMINATION

A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
4. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil- bearing water runoff or airborne dust to adjacent properties and walkways.

C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust

locations when requested, and obtain Landscape Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

C. Lay out plants at locations directed by Landscape Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

3.3 PLANTING AREA ESTABLISHMENT

A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation." or Section 329115 "Soil Preparation (Performance Specification)."

B. Placing Planting Soil: Place and mix planting soil in-place over exposed subgrade.

C. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

D. Application of Mycorrhizal Fungi: At time directed by Landscape Architect, broadcast dry product uniformly over prepared soil at application rate according to manufacturer's written recommendations.

3.4 EXCAVATION FOR TREES AND SHRUBS

A. Planting Pits and Trenches: Excavate circular planting pits.

1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations
with vertical sides are unacceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
2. Excavate approximately three times as wide as ball diameter for balled and
burlapped, balled and potted, container-grown and fabric bag-grown stock.
3. Excavate at least 12 inches (300 mm) wider than root spread and deep enough to
accommodate vertical roots for bare-root stock.
4. Do not excavate deeper than depth of the root ball,

measured from the root flare to the bottom of the root ball.

5. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
6. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
7. Maintain supervision of excavations during working hours.
8. Keep excavations covered or otherwise protected overnight, after working hours or when unattended by Installer's personnel.
9. If drain tile is indicated on Drawings or required under planting areas, excavate to top of porous backfill over tile.

B. Backfill Soil: Subsoil and topsoil removed from excavations may be used as backfill soil unless otherwise indicated.

C. Obstructions: Notify Landscape Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

1. Hardpan Layer: Drill 6-inch- (150-mm-) diameter holes, 24 inches (600 mm) apart,

into free-draining strata or to a depth of 10 feet (3 m), whichever is less, and backfill with free- draining material.

D. Drainage: Notify Landscape Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE, SHRUB, AND VINE PLANTING

A. Inspection: At time of planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.

B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

C. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch (25 mm) above adjacent finish grades.

1. Backfill: Planting soil for trees, use excavated soil for backfill only if approved by Landscape Architect.
2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.
   a. Quantity: As indicated on Drawings or as recommended by Landscape Architect.
5. Continue backfilling process. Water again after placing and tamping final layer of soil.

D. Balled and Potted and Container-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch (25 mm) above adjacent finish grades.

1. Backfill: Planting soil for trees, use excavated soil for backfill only if approved by Landscape Architect.
2. Carefully remove root ball from container without damaging root ball or plant.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
   Place planting tablets equally distributed around each planting pit when pit is
4. approximately one-half filled. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not

place tablets in bottom of the hole.

a. Quantity: As indicated on Drawings or as recommended by manufacturer.

5. Continue backfilling process. Water again after placing and tamping final layer of soil.

E. Fabric Bag-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch (25 mm) above adjacent finish grades.

1. Backfill: Planting soil for trees, use excavated soil for backfill only if approved by Landscape Architect.
2. Carefully remove root ball from fabric bag without damaging root ball or plant. Do not use planting stock if root ball is cracked or broken before or during planting operation.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.

a. Quantity: As indicated on Drawings or as recommended by manufacturer.

5. Continue backfilling process. Water again after placing and tamping final layer of soil.

F. Bare-Root Stock: Set and support each plant in center of planting pit or trench with root flare 1 inch (25 mm) above adjacent finish grade.

1. Backfill: Planting soil for trees, use excavated soil for backfill only if approved by Landscape Architect.
2. Spread roots without tangling or turning toward surface. Plumb before backfilling, and maintain plumb while working.
3. Carefully work backfill in layers around roots by hand. Bring roots into close contact with the soil.
4. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
5. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside soil-covered roots about 1 inch (25

mm) from root tips; do not place tablets in bottom of the hole or touching the roots.

a. Quantity: As indicated on Drawings or as recommended by manufacturer.

6. Continue backfilling process. Water again after placing and tamping final layer of soil.

G. Watering Pipe: During backfilling, install watering pipe 4 feet (1.25 m) deep into the planting pit outside the root ball as indicated on Drawings and with top of pipe 1 inch (25 mm) above the mulched surface.

H. Slopes: When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.6 MECHANIZED TREE-SPADE PLANTING

A. Trees may be planted with an approved mechanized tree spade at the designated locations. Do not use tree spade to move trees larger than the maximum size allowed for a similar field-grown, balled-and-burlapped root-ball diameter according to ANSI Z60.1, or larger than manufacturer's maximum size recommendation for the tree spade being used, whichever is smaller.

B. Use the same tree spade to excavate the planting hole as will be used to extract and transport the tree.

C. When extracting the tree, center the trunk within the tree spade and move tree with a solid ball of earth.

D. Cut exposed roots cleanly during transplanting operations.

E. Plant trees following procedures in "Tree, Shrub, and Vine Planting" Article.

F. Where possible, orient the tree in the same direction as in its original location.

3.7 TREE, SHRUB, AND VINE PRUNING

A. Remove only dead, dying, or broken branches. Do not prune for shape.

B. Prune, thin, and shape trees, shrubs, and vines as directed by Landscape Architect.

C. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Landscape Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

D. Do not apply pruning paint to wounds.

3.8 TREE STABILIZATION

A. Trunk Stabilization by Upright Staking and Tying: Install trunk stabilization as follows unless otherwise indicated:

1. Upright Staking and Tying: Stake trees of 2- through 5-inch (50- through 125-mm) caliper. Stake trees of less than 2-inch (50-mm) caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches (450 mm) below bottom of backfilled excavation and to extend to the dimension indicated on Drawings above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.
2. Upright Staking and Tying: Stake trees with two stakes for trees up to 12 feet (3.6 m) high and 2-1/2 inches (63 mm) or less in caliper; three stakes for trees less than 14 feet (4.2 m) high and up to 4 inches (100 mm) in caliper. Space stakes equally around trees.
3. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
4. Support trees with two strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

B. Trunk Stabilization by Staking and Guying: Install trunk stabilization as follows unless otherwise indicated on Drawings. Stake and guy trees more than 14 feet (4.2 m) in height and more than 3 inches (75 mm) in caliper unless otherwise indicated.

1. Site-Fabricated, Staking-and-Guying Method: Install no fewer than three guys

spaced equally around tree.

a. Securely attach guys to stakes 30 inches (760 mm) long, driven to grade. Adjust spacing to avoid penetrating root balls or root masses. Provide turnbuckle or compression spring for each guy wire and tighten securely.
b. For trees more than 6 inches (150 mm) in caliper, anchor guys to wood deadmen buried at least 36 inches (900 mm) below grade. Provide turnbuckle or compression spring for each guy wire and tighten securely.
c. Support trees with bands of flexible ties at contact points with tree trunk and reaching to turnbuckle or compression spring. Allow enough slack to avoid rigid restraint of tree.
d. Support trees with guy cable or multiple strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk and reaching to turnbuckle or compression spring. Allow enough slack to avoid rigid restraint of tree.
e. Attach flags to each guy wire, 30 inches (760 mm) above finish grade.
f. Paint turnbuckles or compression springs with luminescent white paint.

2. Proprietary Staking and Guying Device: Install staking and guying system sized and positioned as recommended by manufacturer unless otherwise indicated and according to manufacturer's written instructions.

C. Root-Ball Stabilization: Install at- or below-grade stabilization system to secure each new planting by the root ball unless otherwise indicated.

1. Wood Hold-Down Method: Place vertical stakes against side of root ball and drive them into subsoil; place horizontal wood hold-down stake across top of root ball and screw at each end to one of the vertical stakes.

a. Install stakes of length required to penetrate at least 18 inches (450 mm) below bottom of backfilled excavation. Saw stakes off at horizontal stake.
b. Install screws through horizontal hold-down and penetrating at least 1 inch (25 mm) into stakes. Predrill holes if necessary to prevent splitting wood.

c. Install second set of stakes on other side of root trunk for larger trees.

2. Proprietary Root-Ball Stabilization Device: Install root-ball stabilization system sized and positioned as recommended by manufacturer unless otherwise indicated and according to manufacturer's written instructions.

D. Palm Bracing: Install bracing system at three or more places equally spaced around perimeter of trunk to secure each palm until established unless otherwise indicated.

1. Site-Fabricated Palm-Bracing Method:

a. Place battens over padding and secure battens in place around trunk perimeter with at least two straps, tightened to prevent displacement. Ensure that straps do not contact trunk.

b. Place diagonal braces and cut to length. Secure upper ends of diagonal braces with galvanized nails into battens or into nail-attached blocks on battens. Do not drive nails, screws, or other securing devices into palm trunk; do not penetrate palm trunk in any fashion. Secure lower ends of diagonal braces with stakes driven into ground to prevent outward slippage of braces.

2. Proprietary Palm-Bracing Device: Install palm-bracing system sized and positioned as recommended by manufacturer unless otherwise indicated and according to manufacturer's written instructions.

3.9 ROOT-BARRIER INSTALLATION

A. Install root barrier where trees are planted within 60 inches (1500 mm) of paving or other hardscape elements, such as walls, curbs, and walkways, unless otherwise indicated on Drawings.

B. Align root barrier vertically unless otherwise indicated on the Drawing(s), and run it linearly along and adjacent to the paving or other hardscape elements to be protected from invasive roots.

C. Install root barrier continuously for a distance of 60 inches (1500 mm) in each direction from the tree trunk, for a

total distance of 10 feet (3 m) per tree. If trees are spaced closer, use a single continuous piece of root barrier.

1. Position top of root barrier according to manufacturer's written recommendations.
2. Overlap root barrier a minimum of 12 inches (300 mm) at joints.
3. Do not distort or bend root barrier during construction activities.
4. Do not install root barrier surrounding the root ball of tree.

3.10 PLACING SOIL IN PLANTERS

A. Place a layer of drainage gravel at least 4 inches (100 mm) thick in bottom of planter. Cover bottom with filter fabric and wrap filter fabric 6 inches (150 mm) up on all sides. Duct tape along the entire top edge of the filter fabric, to secure the filter fabric against the sides during the soil-filling process.

B. Fill planter with planting soil. Place soil in lightly compacted layers to an elevation of 1-1/2 inches (38 mm) below top of planter, allowing natural settlement.

3.11 GROUND COVER AND PLANT PLANTING

A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated on Drawings in even rows with triangular spacing.

B. Use planting soil for backfill.

C. Dig holes large enough to allow spreading of roots.

D. For rooted cutting plants supplied in flats, plant each in a manner that minimally disturbs the root system but to a depth not less than two nodes.

E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.12 PLANTING AREA MULCHING

A. Install weed-control barriers before mulching according to manufacturer's written instructions. Completely cover area to be mulched, overlapping edges a minimum of 12 inches (300mm) and secure seams with galvanized pins.

B. Mulch backfilled surfaces of planting areas and other areas indicated.

1. Trees and Treelike Shrubs in Turf Areas: Apply organic/mineral mulch ring of 2-
inch (50- mm) average thickness, with 36-inch (900-mm) radius around trunks or
stems unless otherwise indicated on the Drawings. Do not place mulch within 6
inches (150 mm) of trunks or stems.

2. Organic Mulch in Planting Areas: Apply 2-inch (50-mm) average thickness of
organic mulch extending 12 inches (300 mm) beyond edge of individual planting pit or trench and over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 6 inches (150 mm) of trunks or stems.

3. Mineral Mulch in Planting Areas: Apply 2-inch (50-mm) average thickness of
mineral mulch extending 12 inches (300 mm) beyond edge of individual planting pit or trench and over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 6 inches (150 mm) of trunks or stems.

3.13 EDGING INSTALLATION

A. Wood Edging: Install edging where indicated. Fasten each cut joint or connection with two galvanized nails. Anchor with wood stakes spaced up to 36 inches (900 mm) apart, driven at least 1 inch (25 mm) below top elevation of edging. Use two galvanized nails per stake to fasten edging, of length as needed to penetrate both edging and stake and provide 1/2-inch (13-mm) clinch at point. Predrill stakes if needed to avoid splitting. Replace stakes that crack or split during installation process.

B. Steel Edging: Install steel edging where indicated according to manufacturer's written instructions. Anchor with

steel stakes spaced approximately 30 inches (760 mm) apart, driven below top elevation of edging.

C. Aluminum Edging: Install aluminum edging where indicated according to manufacturer's written instructions. Anchor with aluminum stakes spaced approximately 36 inches (900 mm) to 48 inches (1200 mm) apart, driven below top elevation of edging.

D. Shovel-Cut Edging: Separate mulched areas from turf areas with a 45-degree, 4- to 6-inch- (100- to 150-mm-) deep, shovel-cut edge as indicated on Drawings.

E. Mow-Strip Installation:

1. Excavate for mow strip as indicated on Drawings.
2. Compact subgrade uniformly beneath mow strip.
3. Apply nonselective, pre-emergent herbicide that inhibits growth of grass and weeds.
4. Install edging material, delineating the edge of mow strip.
5. Install weed-control barrier before mulching, covering area of mow strip, and overlapping and pinning edges of barrier at least 6 inches (150 mm) and according to manufacturer's written instructions.
6. Place indicated thickness of mulch, fully covering weed barrier.
7. Rake mulch to a uniform surface level with adjacent finish grades.

3.14 TREE GRATE INSTALLATION

A. Tree Grates: Install according to manufacturer's written instructions. Set grate segments flush with adjoining surfaces. Shim from supporting substrate with soil-resistant plastic. Maintain a 3- inch- (75-mm-) minimum growth radius around base of tree; break away portions of casting, if necessary, according to manufacturer's written instructions.

3.15 INSTALLING SLOW-RELEASE WATERING DEVICE

A. Provide one device for each tree.

B. Place device on top of the mulch at base of tree stem and fill with water according to manufacturer's written instructions.

3.16 PLANT MAINTENANCE

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.

B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.17 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Pre-Emergent Herbicides (Selective and Nonselective): Apply to tree, shrub, and ground-cover areas according to manufacturer's written recommendations. Do not apply to seeded areas.

C. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already- germinated weeds and according to manufacturer's written recommendations.

3.18 REPAIR AND REPLACEMENT

A. General: Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Landscape Architect.

1. Submit details of proposed pruning and repairs.
2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if

approved.

3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Remove and replace trees that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.

1. Provide new trees of same size as those being replaced for each tree of 4 inches (100 mm) or smaller in caliper size.

2. Provide two new tree(s) of 4-inch (100-mm) caliper size for each tree being replaced that measure more than 4 inches (100 mm) in caliper size.

3. Species of Replacement Trees: Same species being replaced or species selected by Landscape Architect.

3.19 CLEANING AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

D. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

D. At time of Substantial Completion, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

3.20 MAINTENANCE SERVICE

A. Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:

1. Maintenance Period: 12 months from date of planting completion and acceptance by Landscape Architect.

B. Maintenance Service for Ground Cover and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:

1. Maintenance Period: Six months from date of planting completion and acceptance by Landscape Architect.

3.21 MAINTENANCE

A. Begin maintenance immediately after each plant is installed and continue to maintain for one (1) year until the end of the guarantee period.

B. Perform the following operations: Watering as often as required to maintain capillary water within 2” of the soil surface around plants; weeding of planting beds by hand; reset plants to proper grades or upright position; add backfill mixture to level to finish grade; seasonal spraying to control fungus, disease or insect pests that may impair plants’ vigor; replenish organic mulch; repair injuries to plants.

C. Replacement of plants required by the Plant Guarantee on a regular monthly basis except during the months of January, February, July and August.

D. Groundcover: Dilute 50 parts to 1 part root enhancer in water (2 oz./gal) and apply as a soil drench every 60 days.

3.22 INSPECTIONS FOR ACCEPTANCE OF WORK

A. Acceptance for Start of Maintenance: Within 15 days after completion of work an inspection for acceptance to start the maintenance period will be made. When the work is accepted, the maintenance period will begin and continue until final acceptance.

B. Final Acceptance: Before final acceptance, the terms of the Plant Guarantee must be met and the project site must be in the condition stipulated under Maintenance Operations.

3.23 MEASUREMENT AND PAYMENT

A. Unit Prices – SEE BID SHEET

B. Above unit prices include all required soil preparation and amendments.

C. Ground cover and shrubs are for perpetration and installation only. Species selection will not be included in the above unit pricing.

END OF SECTION 329300