

**CONTRACT # 1**  
**GENERAL CONSTRUCTION WORK**

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SECTION 011000

SUMMARY OF WORK

PART 1 - GENERAL

1.01 SCOPE OF WORK

This Section includes a description of the major work components for work illustrated on the contract drawings identified as "Environmental and Fuel". A more complete description of the work is provided in individual sections of these Contract Specifications and on the Contract Drawings. The Contractor shall furnish all equipment, labor, materials, and services required for execution and final acceptance of all work required by the Contract Documents.

The Contractor shall comply with the New York City Department of Environmental Protection's Noise Code (15 RCNY 28, Local Law No. 113). Consequently, the Contractor shall develop a Construction Noise Mitigation Plan for approval by the Construction Manager, which shall be available for review at each Construction Site. The project is identified as the Harper Street Yard Capital Project HWQF027C, 32-11 Harper Street, Corona, Queens, New York.

The work to be performed at the Harper Street site by the Environmental and Fuel Contractor includes:

Removal of Hazardous Materials and Asbestos Abatement

The removal of hazardous materials and asbestos abatement work includes: (1.) Removal of both friable and non-friable asbestos containing materials identified in the ACM survey presented in the report entitled, "*Final Report of Asbestos Survey Services Harper Street Yard Demolition of Buildings: 9,9A, and 10 and Floor Leveling, Exhaust System and Roof Upgrade Buildings: 1,2,3,4, and 5 32-11 Harper Street Queens, New York*", dated February 2008, prepared by ATC Associates Inc. (see Appendix A) and (2.) Removal of hazardous materials such as but not limited to sediment/sludge located in the secondary containment dike for the 70,000-gallon above ground storage tanks, fluorescent light fixtures, lead-based paint, miscellaneous pails/drums, oils, aerosols, chemicals, and other materials that would require removal from the Boiler Building, Pump House Building, Structural Pipe Bridge and Tank Farm Area prior to demolition. Asbestos abatement is discussed in Section 028213.

Much of the asbestos, particularly the friable asbestos (e.g. spray-on insulation), was used in ceilings as well as behind walls.

Demolition Work

Demolition work will include demolition, removal and off-site disposal of the existing boiler building, pump house building, structural pipe bridge, and four 70,000-gallon above ground storage tanks and appurtenances; excavation of soil; disposal of all contaminated soil/groundwater, and site restoration. Further details are provided herein and on the Contract Drawings.

**Diesel Fuel System Replacement**

The work associated with the diesel fuel system replacement will include installation of two new 6,000-gallon diesel USTs and associated fueling dispenser island, controls and monitoring systems and appurtenances as well as removal and disposal of the five existing 1,080-gallon USTs and associated fueling dispenser and appurtenances. The Construction Period will be after demolition of the existing boiler building, pump house building, structural pipe bridge, and four 70,000-gallon above ground storage tanks and been completed and will extend for the time period defined by the Construction Manager. The Contractor shall notify the Construction Manager at least five days in advance for all field activities performed during the Construction Period. The notice shall be given by facsimile at a phone number to be provided by the Construction Manager or at an e-mail address also provided by the Construction Manager.

**1.02 LOCATIONS**

The work described above will be completed at the Harper Street Yard New York City Department of Transportation Facility located at 32-11 Harper Street in Corona, Queens, New York.

Information concerning the site history and previous investigations may be available upon request.

**1.03 STATUTES, REGULATIONS, CODES AND POLICIES**

All work included in this contract shall be conducted in strict compliance with all applicable Federal, State and local statutes, regulations, codes and policies. Compliance assurance shall be the responsibility of the Contractor.

**1.04 PERMITS AND LICENSES**

Prior to the start of work under this contract, the Contractor shall obtain any permits or licenses required to do the work. Determination of license and permit requirements shall be the responsibility of the Contractor.

**1.05 WORK TO BE PERFORMED**

**A. Demolition Work**

1. File drawings and required documentation with the New York City Department of Buildings and obtain applicable regulatory permits and approvals as required prior to the commencement of work.
2. The Contractor shall photo-document all pre-existing facilities and general pre-work conditions and submit to the Construction Manager prior to commencement of work. The Contractor shall provide two copies of all photographs to the Construction Manager. Photographs shall be 5" by 7" semi-gloss prints or other format as approved by the Construction Manager. The Construction Manager may request additional photographs prior to authorizing the commencement of any work at the site. Each picture shall contain a description including direction of view.

3. Prepare and submit a detailed Work Plan for the following activities:
- Project mobilization including specifying required staging areas, means of protecting the DOT facilities, the stormwater system and Flushing Bay from adverse impacts from demolition activities.
  - Demolition, removal and off-site disposal of Building 9 "Boiler Building", Building 9A "Tank Farm", Building 10 "Pump House" and structural pipe bridge as specified herein and in the contract documents.
  - The vertical extent of demolition shall extend to one foot below existing concrete floor for Building 9 and Building 10. The vertical extent of demolition for Building 9A "Tank Farm" shall extend to one foot below surrounding existing grade which will require removal of the concrete secondary containment walls to one foot below surrounding grade as well as removing the concrete tank foundations to one foot below the existing surrounding grade (outside of secondary containment structures).
  - Backfilling, compaction and site restoration including placement of asphalt within the entire area.

The detailed Work Plan shall include a schedule showing the sequence of construction activities.

4. Establish all temporary dust and water control facilities; post all signage and implement all site security measures.
5. The Contractor shall prepare and submit an air monitoring plan. The air monitoring plan shall outline how the Contractor intends to protect the demolition worker, DOT workers and the nearby community from chemical, vapor, and particulate hazards that may result during excavation activities. The air monitoring plan shall describe procedures for conducting perimeter air monitoring, establishing vapor and particulate action levels, explaining procedures for responding to vapor and particulate releases, and describing recordkeeping and reporting methods.
6. Perform all building, tank, and adjacent facility demolition activities as identified in the Work Plan and on the contract drawings. Building demolition of existing structures finishes, contents, and appurtenances to 1' below ground surface as described in Section 1.05, Subpart B, Item 3 (above). This work includes but not limited to: roofs, canopies, walls, interior beams, columns, supports slabs on grade, interior equipment, mechanical and electrical systems, fixtures, piping, and appurtenances.
7. Clean the construction areas and sawcut the existing pavement as required.
8. Excavate, remove and dispose of pavement cuttings, soil/groundwater, and any debris.
9. Provide all necessary dewatering within the excavation limits to maintain a dry excavation during the course of work as directed by the Construction Manager.
10. Backfill, compact, and install new asphalt pavement, sub-base, and geotextile reinforcement in accordance with the Contract Drawings and as directed by the

Construction Manager. New asphalt pavement shall be placed such that positive drainage will occur and no stormwater puddling will exceed one inch deep.

11. Consider all soil and groundwater to be "contaminated historic fill" and dispose of in accordance with all local, state and federal codes and requirements.
12. Remove and dispose of all waste such as excess construction material, wood, debris, and any other foreign material in accordance with these Contract Specifications, all local, state and federal regulations and codes, and as directed by the Construction Manager. The Contractor shall forward all waste manifests to the Construction Manager.
13. Restore all pavements and all other areas disturbed during construction to a condition equal to or better than that which existed prior to the commencement of work as directed by the Construction Manager. Surfaces shall be patched to match existing conditions or as otherwise indicated in the Contract Specifications or Drawings.

**B. Diesel Fuel System Replacement**

1. File drawings and required documentation with the New York City Department of Buildings and obtain applicable regulatory permits and approvals as required prior to the commencement of work.
2. The Contractor shall photo-document all pre-existing facilities and general pre-work conditions and submit to the Construction Manager prior to commencement of work. The Contractor shall provide two copies of all photographs to the Construction Manager. Photographs shall be 5" by 7" semi-gloss prints or other format as approved by the Construction Manager. The Construction Manager may request additional photographs prior to authorizing the commencement of any work at the site. Each picture shall contain a description including direction of view.
3. Prepare and submit a detailed Work Plan for the following construction activities:
  - Project mobilization including specifying required staging areas, means of protecting the DOT facilities, the stormwater system and Flushing Bay from adverse impacts from construction activities.
  - Excavation and installation of permanent steel sheeting to facilitate tank construction work.
  - Dewater tank excavation to allow construction of structural support system for new tanks. Dewatering may be significant as the groundwater table elevation is approximately 6 feet below existing grade and petroleum impacted groundwater may be present in the vicinity.
  - Installation of concrete filled steel piles and concrete tank bottom slab.
  - Installation of CMU piers.
  - Installation of two new 6,000-gallon diesel USTs and associated piping to new dispenser island
  - Construction of new dispenser island with two dispensers.
  - Installation of electrical equipment including fuel management system and low voltage wiring (MEP contractor to install line voltage and conduits).
  - Tank testing and start-up of new diesel fueling system.



- Removal of existing diesel tank system in accordance with NYSDEC regulations.
- Backfilling, site restoration, and asphalt paving.

The detailed Work Plan shall include a schedule showing the sequence of construction activities.

4. Complete excavation where the new diesel tanks are to be installed. Dewater tank excavation to allow construction of structural support system for new tanks. Dewatering may be significant as the groundwater table elevation is approximately 6 feet below existing grade and petroleum impacted groundwater may be present in the vicinity. Install permanent steel sheeting to facilitate tank construction work. Geotechnical information is contained in Appendix A.
5. Install concrete filled steel piles, concrete tank bottom slab and CMU piers.
6. Install two new 6,000-gallon fiberglass diesel USTs, associated equipment, piping, electrical and controls to create a fully function system. Control systems shall include but not be limited to fuel inventory management system, emergency stop button and emergency telephone.
7. Construct concrete top slab, dispenser island and surface equipment. Monitoring building construction is contained in the architectural, structural and MEP contract drawings.
8. Complete tank testing and start-up of new diesel fueling system.
9. Excavate and remove existing five 1,080-gallon concrete encased diesel USTs and all associated piping, equipment and electrical components as illustrated on the contract drawings and in accordance with NYSDEC regulations. Apply 500 pounds of RegenOx™ to bottom of excavation if requested by the Construction Manager to remediate residual petroleum impacts.
10. Complete backfilling, site restoration, and asphalt paving.
11. Prepare and submit record drawings showing the extent of the excavation and newly installed UST and associated appurtenances including, but not limited to, underground and aboveground piping, dispenser, tank pad, and dispenser island.
12. Consider all soil and groundwater to be "contaminated historic fill" and dispose of in accordance with all local, state and federal codes and requirements.
13. Prepare and submit an updated Petroleum Bulk Storage (PBS) registration form.
14. Prepare and submit a tank closure report in accordance with the Contract Specifications and as directed by the Construction Manager.

## PART 2 - PRODUCTS

(Not Used)

### **PART 3 - EXECUTION**

#### **3.01 UTILITIES**

Utility termination to of Building 9 "Boiler Building", Building 9A "Tank Farm", Building 10 "Pump House" and structural pipe bridge will be performed by the Contractor prior to initiating the demolition work defined in the Environmental and Fuel specifications.

The Contractor shall protect utility lines or appurtenances that are to remain. It shall be the Contractor's responsibility to locate all existing utilities on site. Any damage shall be repaired by the Contractor at no expense to the City.

Prior to demolition work, the Contractor will provide temporary underground power to the existing diesel fueling station which must remain in operation until after the new diesel fueling station becomes operational.

The tank Contractor shall install low voltage conductors to tank components and equipment. The MEP contractor shall install conduits and line voltage to tank component and equipment.

#### **3.02 DAMAGE TO PROPERTY**

The Contractor shall repair or replace, at their expense, any property damaged as a result of the work being performed under this Contract to a condition equal to or better than that which existed prior to the commencement of the work.

#### **3.03 SEQUENCE OF CONSTRUCTION**

Sequence of construction is as important aspect of the project. The work will be in the following sequence:

1. Removal of hazardous materials and asbestos abatement.
2. Installation of alternative power supply to existing diesel pump station by MEP Contractor.
3. Decommissioning of utilities including power to Building 9, Building 9A, Building 10 and structural pipe bridge by MEP Contractor.
4. Demolition work.
5. New tank construction work.
6. Removal of existing diesel pump station.

It is important that the existing diesel pump station remain operational until the new diesel fueling station is completely operational.

#### **3.04 TRANSPORTATION, HANDLING AND STORAGE**

The Contractor shall coordinate with suppliers and shippers to insure that incoming materials are properly identified with Contractor's name, Contract number and project title, and designated individual to receive shipments. The City will designate an open storage area for the Contractor's use.

**3.05 TRAFFIC CONTROL**

The Contractor shall be responsible for controlling traffic around the construction area(s). The proper use of barricades, warning lights and flagmen shall be included to safely re-route traffic disrupted by construction activities. The Contractor shall conduct construction operations in a manner that limits traffic disruption to the best of their abilities. A Traffic Control Plan shall be submitted to the Construction Manager for approval by as required within the contract specifications.

**3.06 CLEAN-UP AND DISPOSAL OF DEBRIS**

At the end of each workday, the Contractor shall clean the work area to the satisfaction of the Construction Manager. The Contractor shall remove demolition materials from City property. All excavations, or other dangerous construction, shall be barricaded and covered to prevent accidents involving unwary pedestrians or vehicular traffic. Upon completion of each phase of the work, the Contractor shall insure that all dirt, trash and debris, resulting from construction operations, is removed from the work area. Disposal of debris shall be conducted by the Contractor at his own expense and all nonhazardous debris shall be delivered to a State approved sanitary landfill.

**3.07 FIRE PROTECTION REQUIREMENTS**

The Contractor shall comply with New York City local fire codes and regulations and the National Fire Protection Association (NFPA) 241-2004 Standard for Safeguarding Construction, Alteration, and Demolition Operations. Fire extinguishers rated and approved by the NFPA, of sufficient size, type, and quantity to cope with all known hazards, shall be provided by the Contractor at the construction site during the execution of this Contract.

**3.08 EXISTING FEATURES**

The Contractor shall protect and maintain survey and grid stakes, fences, and roads against damage from equipment and vehicular traffic. Any and all damage shall be repaired by the Contractor at no expense to the City.

**3.09 MATERIALS AND EQUIPMENT**

Materials and equipment shall be adequate in capacity for the required usage, shall not create unsafe conditions, and shall meet requirements of all applicable codes and standards and the approval of the Construction Manager and Commissioner.

**3.10 DRAWING LIST**

<u>Drawing No.</u>	<u>Title</u>
H-001	Asbestos and Hazardous Materials Abatement Site Plan
H-002	Asbestos and Hazardous Materials Abatement Site Plan
DM-300.00	Legend, Abbreviations and Notes
DM-301.00	Existing Conditions Plan
DM-302.00	General Site Demolition Plan

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DM-303.00	Detailed Site Demolition Plan
DM-304.00	Site Photos
DM-305.00	Site Photos
DM-306.00	Erosion and Sediment Control Plan
DM-307.00	Erosion and Sediment Control Notes and Details
DM-308.00	Erosion and Sediment Control Details
DM-309.00	Proposed Restoration Plan
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**END OF SECTION**

**SECTION 013230**

**SURVEY REQUIREMENTS**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

The Contractor shall provide all materials, labor, equipment and incidentals required to conduct proper surveys prior to, during and after construction activities.

- A. The Contractor will identify existing site reference points, benchmarks, and baselines. Additional benchmarks which the Contractor may require for performance of work and post construction documentation shall be established by the Contractor and tied into existing USGS data.
- B. The vertical limit of demolition will be established by the Contractor through conventional survey methods. The vertical elevation of the extent of demolition will be one foot below the existing concrete floor slab of Building 9 (Boiler Building) and Building 10 (Pump House). In order to establish this elevation the contractor shall obtain floor elevation shots and submit to the Construction Manager an elevation plan within the building. The vertical extent of demolition within these buildings will be one foot below the established floor elevation. In order to establish the vertical extent of demolition for Building 9A (Tank Farm), the Contractor shall shoot ground elevations every 10 feet around the perimeter of the building. The vertical extent of demolition within Building 9A will be one foot below the established surrounding grade.

**1.02 QUALITY CONTROL**

All survey, layout and related work shall be performed and all survey notes and documents shall be signed by a land surveyor registered in the State of New York.

**1.03 SUBMITTALS**

- A. Prior to start of any survey work, the Contractor shall submit to the Construction Manager for approval the names, addresses, telephone numbers and qualifications of the surveyor, crew chief, superintendent, Registered Land Surveyor, and all other persons who are proposed to perform surveys or survey related duties.
- B. The Contractor shall submit a detailed Field Change Request to the Construction Manager to document changes and nonconformances for Construction Manager review and approval, prior to the start of construction.
- C. The Contractor shall submit a certificate signed by the Surveyor, certifying that elevations and locations of site features are in conformance, or nonconformance, with Contract Documents. Any nonconformance shall be documented by a Field Change Request form and shall be subject to review and acceptance by the Construction Manager prior to final disposition (i.e., payment, corrective actions, etc.).

- D. The Contractor shall submit a drawing to the Construction Manager locating all the existing utilities present at the site and location plan of the new facility. The drawing shall show existing ground levels and both vertical and horizontal controls.
- E. The Contractor shall submit to the Construction Manager the elevation plan for Building 9 and Building 10 for approval. The Contractor shall also submit to the Contractor the elevation plan of the surrounding grade for Building 9A for approval. These elevations will establish the vertical extent of demolition.

#### 1.04 PROJECT RECORD DOCUMENTS

- A. The Contractor shall maintain on site a complete, accurate log of the survey control work as it progresses.
- B. Upon completion of the work, the Contractor shall submit Record Documents to the Construction Manager under the provisions of SECTION: PROJECT CLOSEOUT.

### PART 2 - PRODUCTS

#### 2.01 MATERIALS

- A. The Contractor shall provide all materials required to properly perform the surveys, including, but not limited to, instruments, tapes, rods, measures, mounts and tripods, stakes and hubs, nails, ribbons, other reference markers, and all else as required. All material shall be of good professional quality and in first-class condition.
- B. All lasers, transits, and other instruments shall be calibrated and maintained in accurate calibration throughout the execution of the work.
- C. Calibration certificates shall be submitted to the Construction Manager prior to the use of any instrument.

### PART 3 - EXECUTION

#### 3.01 GENERAL

The Contractor shall exercise extreme care during the execution of all phases of the Work to minimize disturbance to existing property and landscape in areas surrounding the Work Site. Accuracy for all elevation control surveys shall be +0.01 feet. Accuracy for horizontal control and angles shall be +0.01 feet and to the nearest one (1) second, respectively.

#### 3.02 INSPECTION

The Contractor shall verify with the Construction Manager locations of site reference and survey control points prior to starting work. The Contractor shall promptly notify the Construction Manager of any discrepancies discovered. The Contractor shall also verify layouts periodically during construction.

**3.03 SURVEY REFERENCE POINTS**

- A. Contractor shall protect survey control points prior to starting Site Work and preserve permanent reference points during construction. The Contractor shall not relocate site reference points without prior written approval from the Construction Manager.
- B. The Contractor shall promptly report to the Construction Manager the loss, damage, or destruction of any reference point or relocation required because of changes in grades, or other reasons. The Contractor shall replace dislocated survey control points based on original survey control at no additional cost to the City. Replacement of dislocated survey control points shall be done by a New York State licensed land surveyor, approved by the Construction Manager.

**3.04 SURVEY REQUIREMENTS**

- A. The Contractor shall reference survey and site reference points to the provided control monuments. Locations of survey control points will be recorded, with horizontal and vertical data, on Project Record Documents.
- B. The Contractor shall establish lines, levels and lay out by instrumentation, locations of all existing utilities, site features to be constructed including necessary stakes for cut, fill, placement, and grading operations, slopes, and invert elevations.
- C. The Contractor shall, with his own forces, obtain working or construction lines or grades as needed.
- D. All identified reference marks shall be carefully preserved and, if destroyed or removed without the Construction Manager's approval, be reset at the Contractor's own expense.
- E. The cost to the Contractor for the work and delays occasioned by lines and grades, or making other necessary measurements, will be included in the lump sum prices for those items of work.
- F. All work not done with the methods and equipment as submitted by the Contractor and approved by the Construction Manager shall be removed and replaced at the Contractor's own expense unless instructed otherwise by the Construction Manager.
- G. It shall be the duty of the Contractor to keep the Construction Manager informed of the times and places at which he intends to work in order to provide the Construction Manager an ample opportunity to furnish and/or check the lines and elevations with minimum inconvenience or delay to the Contractor.

END OF SECTION

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**SECTION 013553**

**SECURITY**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

The Contractor shall provide all labor, materials, and equipment required to implement site security measures during construction. The Contractor shall be responsible for maintaining site security in work area 24 hours a day, 7 days a week including holidays throughout the duration of the Contract. The Contractor shall be responsible for the control of all persons, equipment and vehicles entering and leaving the site.

**1.02 SUBMITTALS**

The Contractor shall upon request submit the Security Plan to the Construction Manager for his review and approval. This plan will include:

1. Description of proposed daily security operation.
2. Provisions for conducting security checks including method and frequency.

**PART 2 - PRODUCTS**

(Not Used)

**PART 3 - EXECUTION**

**3.01 GENERAL**

- A. The Contractor shall safely guard all work, materials, equipment, and property from loss, theft, damage, and vandalism.
- B. The Contractor shall employ security guards as needed to provide the required security and prevent unauthorized entry.
- C. If existing fencing or barriers are breached or removed for purposes of construction, the Contractor shall provide and maintain temporary security fencing equal to the existing, and in a manner satisfactory to the Construction Manager.
- D. The Contractor shall be responsible for maintaining a log of all security incidents. This log shall be furnished to the Construction Manager upon request.
- E. The Contractor shall repair all damage to the property of New York City and others arising from failure to provide adequate security.
- F. The Contractor may make no claim against the City of New York or the Construction Manager for damage resulting from trespass.

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- G. Vehicular access to the site shall be restricted to authorized vehicles only.
- H. The Contractor shall require all personnel and visitors having access to the site to sign in and out, and shall keep a record of all site access.

**END OF SECTION**

**SECTION 015526**

**MAINTENANCE AND PROTECTION OF TRAFFIC**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

The Contractor shall provide all labor, materials, and equipment required for furnishing, installing, relocating and removing all temporary barricades, barriers, steel plates, decking, painting, signing, etc. as required by the Construction Manager for the maintenance and protection of traffic.

It is critical that the construction work completed by the Contractor does not interfere with the operations of the DOT at the Harper Street Yard facility.

**1.02 REFERENCE STANDARDS**

Work shall conform to the requirements of the New York State Department of Transportation (NYSDOT) Standard Specifications for Construction and Materials.

**1.03 SUBMITTALS**

- A. Submittals shall comply with provisions of SECTION: SUBMITTALS.
- B. The Contractor shall submit a detailed construction sequence and maintenance of traffic plan to the Construction Manager upon request.

**1.04 MEETINGS AND NOTIFICATIONS**

The Contractor shall give advance notice of start of construction to the Construction Manager and to the various City agencies and to commercial businesses, as required. In the event that a Contractor's operations will require disruption of traffic flow, written permission shall be obtained from the City and the Construction Manager at least five days in advance of beginning that portion of the work.

**1.05 SNOW REMOVAL**

The Contractor shall provide all snow plowing and removal within the Contract limits. Snow removal shall commence immediately upon direction of the Construction Manager.

**PART 2 - PRODUCTS**

**2.01 MATERIALS**

- A. General: Except as otherwise specified or indicated, all materials shall comply with the requirements of the appropriate sections of NYSDOT Standard Specifications for Construction and Materials.

- B. For each item, the Contractor shall submit certifications of compliance with NYSDOT Specifications.

### **PART 3 - EXECUTION**

#### **3.01 GENERAL**

- A. The Contractor shall provide a travel way suitable for moving traffic. The travel way shall be kept reasonably smooth and hard at all times and shall be well drained and free of potholes, bumps, irregularities and depressions that hold or retain water. Construction operations shall be conducted to insure a minimum of traffic delay. The necessary equipment and personnel to attain and maintain a satisfactory riding surface shall be available and used as needed at all times when work is under way and when work is temporarily suspended for any period of time. Special attention to maintenance of a satisfactory travel way shall be given during weekends, holidays and the winter season.
- B. The Contractor shall install steel plates over all open excavations when no work is in progress as directed by the Construction Manager.
- C. The unlimited access of emergency vehicles (fire apparatus, ambulances, etc.) shall take priority over all other vehicles and/or work or other operations.
- D. Before work is started, the Contractor shall arrange with the City and the Construction Manager for a primary means of access and a sequence or procedure for use of site access points. Other points of site access may be used only after obtaining the Construction Manager's written permission.
- E. Traffic control at the locations of off-site utility work shall comply with all applicable local codes, regulations and requirements.

#### **3.02 TRAFFIC CONTROL**

The Contractor shall provide a sufficient number of competent flagmen in areas where construction equipment is operating in potential conflict with public traffic, regardless of volume of traffic or the sight distance. Flagmen shall wear orange caps or hats and vest in conformance with the NYSDOT Specifications and shall direct traffic in conformance with Specifications.

#### **3.03 DRAINAGE**

The Contractor shall devote particular attention to all drainage facilities, keeping them fully operative at all times. Provisions shall be made at all times to adequately drain the traveled way and the remainder of the work areas.

#### **3.04 INGRESS AND EGRESS**

The Contractor shall provide and maintain, at all times, safe and adequate ingress and egress to and from intersecting streets, businesses and commercial establishments at existing or new access points, consistent with the work, unless otherwise authorized by the Construction Manager.

The existing pavement at the intersecting streets shall not be disturbed without prior consent of the Construction Manager and New York City.

**3.05 DELINEATION AND GUIDING DEVICES**

- A. The Contractor shall furnish, erect, move and remove delineation and guiding devices as required and as directed by the Construction Manager. In areas where grading is being done, a safe and reasonable roadway shall be properly delineated at all times, either by the use of guiding devices or flagmen. The Contractor shall delineate areas where there is a drop-off near the edge of the traveled way and areas on which it is unsafe to travel.
- B. Drums or containers, 30 to 55 gallon capacity, set on end, may be used as delineators, provided they are properly painted and reflectorized in accordance with the NYSDOT Standard Specifications. They shall be kept clean at all times. Other markers or delineators may be circular or rectangular in shape and shall be constructed of reflective sheeting having a minimum area of 20 square inches or of reflective buttons having a minimum diameter of 3 inches. All reflective delineators or markers shall conform to the requirements of the NYSDOT Standard Specifications for Construction and Materials.
- C. At commercial establishments the entire entrance area between adjacent markers, shall be kept safe and smooth for convenient ingress and egress. Delineators shall be substantially mounted so that the bottom of the reflective unit is 4 feet above the elevation of the traveled way. Any area determined by the Construction Manager to be particularly hazardous, shall be marked by the use of signal flashers with large reflectorized yellow lenses in addition to the reflective markings.

**3.06 SIGNS**

- A. All existing street signs, delineators and their supports within the contract limits shall remain under the control and jurisdiction of the Construction Manager and shall be maintained for the duration of the contract by the Contractor as directed by the Construction Manager. Any signs not authorized by the Construction Manager shall be removed from the work areas.
- B. The Contractor, when ordered, shall remove existing signs, markers and delineators and their supports which interfere with his construction operations; store, protect, clean and replace them as directed in a location approved by the Construction Manager. Signs, markers and delineators not to be replaced shall be cleaned and delivered to the Construction Manager as directed. Signs, markers and delineators lost or damaged because of negligence on the part of the Contractor, shall be replaced at the Contractor's expense.

**3.07 EXISTING PAVEMENT MARKINGS**

- A. The Contractor shall remove, as soon as practicable, existing pavement markings where indicated on the Drawings, or where ordered by the Construction Manager. This shall include pavement markings that are added during the course of the work. If darkness or inclement weather interferes with removal operations, such operations should be accomplished during the next daylight period or as soon thereafter, as weather conditions permit.
- B. The method of removal is subject to the approval of the Construction Manager. Painting out pavement markings will only be approved for very short term use. Grinding, scraping,

sandblasting, and similar operations shall be conducted in such a manner that the finish pavement surface is not damaged or left in a pattern that will mislead or misdirect the motorist.

**3.08 CONSTRUCTION SIGNS**

- A. Reflectorized Signs: The Contractor shall furnish and erect, move and remove, as directed by the Construction Manager, reflectorized signs to adequately and safely inform and direct the motorist and to satisfy legal requirements.
- B. Signs shall be kept clean, mounted at the required height on adequate supports and placed in proper position and alignment so as to give maximum visibility both night and day. All wood supports and backs of plywood sign panels shall be painted with two coats of white paint. All signs and markers shall indicate actual existing conditions and shall be moved, removed, relocated or changed immediately, as directed by the Construction Manager. Sign sizes and details shall conform to the NYSDOT Standard Specifications.
- C. Signs shall be mounted in accordance with the NYSDOT Standard Specifications. All signs shall be mounted at a height of at least five (5) feet. Under special conditions, signs may be mounted at a greater height, as ordered by the Construction Manager, to fit the situation.
- D. Signs shall be the property of the Contractor and shall be maintained in good condition for the duration of the Contract and removed from the work site when no longer required and as directed by the Construction Manager.

**3.09 LIGHTING**

Public travelways shall be lighted in accordance with New York City requirements. Where necessary, the Contractor shall furnish, install and maintain temporary lighting and pay all associated charges.

**3.10 CONSTRUCTION BARRICADES AND LIGHTING FOR CONSTRUCTION BARRICADES**

- A. The Contractor shall furnish, erect, move and remove construction barricades and lighting for construction barricades, as directed by the Construction Manager.
- B. Where indicated by the Construction Manager, construction barricades shall be supplemented either by approved flashing or steady burning lights.
- C. Steady burning or flashing barricade lights shall have a minimal nominal diameter of 7 inches and shall emit yellow light. Steady burning lights may be used to supplement other channelizing devices to delineate the traveled way. Flashing lights shall not be used for delineation or channelizing purposes.
- D. Flashing barricade lights shall be either Type A, Low Intensity, or Type B, High Intensity. High intensity lights shall be used where barricade lights are required to operate 24 hours per day. Low intensity lights shall be used where barricade lights are required only at night. In that event, the hours for operation of the low intensity lights shall be dusk to dawn.

- E. Steady burning lights shall have a minimum beam candle power of 2 candles maintained with a solid angle of 9° on each side of the vertical axis, and 5° above and 5° below the horizontal axis. The hours for operation of steady burning barricade lights shall be dusk to dawn.

**3.11 PAVEMENT DELINEATION**

- A. The Contractor shall furnish, apply, and when so ordered, remove pavement delineation as ordered by the Construction Manager in accordance with the NYSDOT Standard Specifications. Unless otherwise ordered by the Construction Manager, any course of asphalt concrete upon which traffic will be maintained shall be properly delineated in accordance with this subsection before the end of the working day.
- B. If paint is used, it shall be applied in accordance with the Construction Specifications for Pavement Marking Paints of the NYSDOT Standard Specifications. If tape is used, it shall be applied in accordance with manufacturer's recommendations, including the use of a primer where needed. The pavement surface shall be clean and dry and of a surface temperature recommended by the tape manufacturer at the time of tape installation. Tape shall conform to the shape of, and adhere to the surface upon which it is applied. Any tape that fails to adhere to the pavement surface during the period of use shall be replaced by the Contractor at no expense to the City.
- C. Inclement weather or other factors may prevent the installation of permanent markings, either by the Contractor or others, in time for the opening to traffic of such pavement or structure. The Contractor, in such cases, shall install temporary pavement delineations as approved and at the locations directed by the Construction Manager.

**3.12 ACCESS TO FIRE HYDRANTS AND FIRE ALARM BOXES**

- A. Free access must be maintained to every fire hydrant, fire alarm box and standpipe connection. When required, hydrants shall be extended by suitable tube or piping to an accessible point as approved by the Construction Manager. No obstruction will be allowed at any time within 15 feet of fire hydrant.
- B. Where materials are placed in the vicinity of a fire hydrant or a fire alarm box, and to such height as to prevent the same from being readily seen, the position of such hydrant or fire alarm box shall be indicated by suitable signals, both day and night.

**3.13 PROTECTION AGAINST FIRE**

- A. The utmost care shall be exercised by the Contractor to avoid angles, recesses or pockets in which papers or rubbish may collect and produce a fire hazard.
- B. Such provisions as may be necessary in the opinion of the Construction Manager to prevent or correct such fire hazards shall be installed by the Contractor.

**END OF SECTION**

**NO TEXT ON THIS PAGE**



**SECTION 015600**

**SPECIAL CONTROLS**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

The Contractor shall provide all controls required to comply with State and Federal laws, local regulations and the Contract Documents including, but not limited to, those described in this Specification Section. It is a high priority for this project to protect and maintain the stormwater collection system at the site. Several contract drawings have been prepared specifically to reduce the potential for erosion and the release of sediment laden water to Flushing Bay. The Contractor shall furnish a petroleum spill kit during the mobilization stage of construction to allow for immediate response in the event of a petroleum release. If the spill kit is deployed during the construction phase, a new spill kit shall be furnished by the Contractor to be secured in the Monitoring Building to address spills that may occur during the operations phase of the project.

The Contractor shall prevent impacts to construction workers and DOT staff from volatile organic contaminants through the implementation of an air monitoring program. Treatment of pumped water from dewatering operations will also be required prior to discharge.

- A. The Contractor shall plan and take all necessary and approved precautions to protect partially completed work.

**1.02 CONTROLS**

**A. Air and Noise Pollution:**

- 1. The Contractor shall be responsible for curtailing noise, smoke, fumes, and any other nuisance resulting from his operations to levels acceptable to the DOT and surrounding community as approved by the Commissioner and the Regulatory Agencies.
- 2. The Contractor shall, upon written notification from the Commissioner, make any repairs, replacements, adjustments, additions and furnish mufflers when necessary to fulfill requirements of this section.

**B Explosives and Blasting: Blasting will not be permitted.**

**C. Temporary Soil Erosion and Water Pollution Controls:**

- 1. Work shall consist of temporary control measures as required by SECTION: EROSION AND SEDIMENT CONTROL and as ordered by the Commissioner during the life of the Contract to control soil erosion and water pollution, through use of berms, dikes, dams,

sediment basins, fiber mats, netting, gravel, mulches, grasses, slope drains, and other approved erosion control devices or methods.

2. The Contractor shall incorporate all permanent erosion and siltation/sediment control features into the project at the earliest practicable time as outlined in the approved schedule. Temporary control measures shall be used to correct conditions that develop during construction; that are needed prior to installation of permanent control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features of the project. The Contractor shall insure positive drainage of all existing and newly graded areas, borrow soil areas, and other construction areas, as applicable, during each phase of the work.
3. In the event of conflict between these specification requirements and pollution control laws, rules or regulations or other Federal or State or local agencies, the more restrictive laws, rules or regulations shall apply.

## **PART 2 - PRODUCTS**

### **2.01 PETROLEUM SPILL KIT**

The Contractor shall provide a petroleum spill kit during the mobilization stage of construction to allow for immediate response in the event of a petroleum release. If the spill kit is deployed during the construction phase, a new spill kit shall be furnished by the Contractor to be secured in the Monitoring Building to address spills that may occur during the operations phase of the project. The spill kit shall contain the following items at a minimum:

- 55-gallon plastic drum for storage of spill kit materials.
- Fifty 15 by 19 inch absorbent pads.
- Four 3 inch diameter by 12 foot long petroleum absorbent socks.
- Ten pair of chemical resistant gloves.
- Eight 17 by 19 inch petroleum absorbent pillows.
- Five disposable bags.
- One pair of goggles.

- One emergency response guide.

**PART 3 - EXECUTION**

(Not Applicable)

**END OF SECTION**

**NO TEXT ON THIS PAGE**

SECTION 015713

EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.01 SCOPE OF WORK

Work in described in this Section includes all labor, materials, equipment, and services necessary to prepare and implement a site-specific Erosion and Sediment Control Plan (E&S). It is a high priority for this project to protect and maintain the stormwater collection system at the site. Several contract drawings have been prepared specifically to reduce the potential for erosion and the release of sediment laden water to Flushing Bay.

- A. The Contractor shall establish temporary and permanent run-on, run-off, erosion, slope protection and sediment controls, and maintain the features as necessary in compliance with the site-specific Erosion and Sediment Control Plan.
- B. Temporary Controls: The Contractor shall furnish, install, maintain throughout construction, remove following construction, and construct diversion swales, silt fences and straw bale dikes, check dams, erosion control blankets, and other temporary erosion and sediment control measures as shown on the Contract Drawings, as applicable and necessary, for all areas within the Project limits and affected areas outside the Project.
- C. Stockpiles: The Contractor shall provide temporary vegetation and erosion control measures for all soil stockpiles.
- D. The Contractor shall install erosion control fabric as necessary to stabilize proposed and existing drainage channels and slopes where flows may not otherwise allow the establishment of permanent vegetation.
- E. The Contractor shall furnish a petroleum spill kit during the mobilization stage of construction to allow for immediate response in the event of a petroleum release. If the spill kit is deployed during the construction phase, a new spill kit shall be furnished by the Contractor to be secured in the Monitoring Building to address spills that may occur during the operations phase of the project.

1.02 GENERAL REQUIREMENTS

- A. Site specific erosion and sediment control shall be provided by Contractor throughout the project duration. All materials and activities shall be in accordance with the latest version of the following:

1. New York Guidelines for Urban Erosion and Sediment Control (Federal Publication).
2. New York Surface Water and Groundwater Quality Standards and Effluent Standards 6 NYCRR700-705.
3. Federal Water Quality Criteria 40 CFR131.
4. New York Water Pollution Control Regulations 6 NYCRR608, 610-614.

### 1.03 SUBMITTALS

#### A. Contractor's Erosion and Sediment Control Plan:

1. The Contractor shall submit for the Owner's approval, an Erosion and Sediment Control Plan.
2. The Plan shall apply the requirements of the State guidelines to the Contractor's proposed means and methods.
3. Specific information shall include, but not limited to, the following:
  - Specific products to be used.
  - Specific locations and alignments of perimeter protection, diversion facilities, inlet protection, erosion control blank lists, construction entrances, and other proposed features.
  - Specific sequencing of construction operations and installation of control measures.

- B. The Contractor shall be responsible for obtaining approvals, from regulators and the Owner, for his site-specific Erosion and Sediment Control Plan, and all variations from the other Contract Documents.

## PART 2 - PRODUCTS

### 2.01 PETROLEUM SPILL KIT

The Contractor shall provide a petroleum spill kit during the mobilization stage of construction to allow for immediate response in the event of a petroleum release. If the spill kit is deployed during the construction

phase, a new spill kit shall be furnished by the Contractor to be secured in the Monitoring Building to address spills that may occur during the operations phase of the project. The spill kit shall contain the following items at a minimum:

- 55-gallon plastic drum for storage of spill kit materials.
- Fifty 15 by 19 inch absorbent pads.
- Four 3 inch diameter by 12 foot long petroleum absorbent socks.
- Ten pair of chemical resistant gloves.
- Eight 17 by 19 inch petroleum absorbent pillows.
- Five disposable bags.
- One pair of goggles.
- One emergency response guide.

### PART 3 - EXECUTION

#### 3.01 GENERAL

- A. Erosion and Sediment practices are noted on the Contract Drawings. Specific implementation shall be as provided in the Contractor's approved "Erosion and Sediment Control Plan."
- B. In the event of a petroleum spill, the Contractor shall deploy the petroleum spill kit to minimize impacts to the stormwater sewer system.

END OF SECTION

**NO TEXT ON THIS PAGE**



**SECTION 015719**

**DUST CONTROL**

**PART 1 – GENERAL**

**1.01 SCOPE OF WORK**

This section specifies the Contractor's requirements for controlling dust, windblown construction or demolition debris generated during the execution of the Work of this Contract, and the procedures to minimize earthen materials tracked onto roadways, both on-site and off-site, by the Contractor's operations.

**1.02 GENERAL REQUIREMENTS**

- A. The Contractor is hereby advised that historically prevailing wind patterns and wind gusts for this site will require diligence to minimize and control the generation of dust.
- B. The Contractor shall take the necessary measures, in addition to those required by federal, state and local laws and regulations, to minimize the migration of dust, windblown construction/demolition debris, and earthen material from work areas including the utilization of wind indicators and air monitoring.
- C. In the event of conflict between these requirements and pollution control laws, rules or regulations of federal, state or local agencies, the more restrictive laws, rules or regulations shall apply.

**1.03 SUBMITTALS**

- A. The Contractor shall prepare and submit the Dust and Windblown Demolition Debris Control Plan within 5 working days before the Pre-Work Conference to the Engineer for review and approval.
- B. The Plan shall identify equipment to be used and describe procedures to be implemented to minimize the creation and dispersion of dust and the removal of earthen materials tracked onto the site and off-site paved roadways by construction vehicles.
- C. The Plan shall address major construction activities including, but not limited to, such activities as clearing, grubbing, demolition excavation, backfilling, grading, and topsoiling, that will contribute to those conditions which can generate dust. The Contractor shall indicate the means and methods to control the generation of dust.
- D. Approval of the Contractor's Dust Control Plan, by the Engineer, shall be required prior to the start of any work by the Contractor.

- E. The Contractor shall be responsible for the adequacy of the Dust Control Plan regardless of approval by the Engineer.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Water shall be clear, potable, free from salt, oil and other deleterious materials.
- B. Calcium Chloride is not an approved dust suppressant for this Project.

## **PART 3 - EXECUTION**

### **3.01 DUST CONTROL**

The Contractor shall take necessary measures, in addition to those required by federal, state and local laws and regulations, to minimize the migration of dust off-site due to on-site activities.

- A. Air monitoring personnel hired by the Owner will monitor work areas for levels of total particulates and fibers for comparison with action levels defined in the Dust Control Plan.
- B. When air-monitoring personnel indicate that the work area may contain elevated levels of particulates and/or fibers the Contractor shall restrict some or all work practices until control procedures have been instituted to prevent contaminant migration.
- C. Control measures shall include amended water application, erection of wind barriers near sensitive populations and work stoppage above certain wind velocities.
- D. Dust generating surfaces within the active work limits shall be sprayed with amended water to provide complete moistening of the structures and C&D debris or as otherwise directed by the Commissioner.
- E. The Contractor shall comply with all applicable regulations for obtaining and using amended water that is clean, potable, free from salt, oil and other deleterious materials.

### **3.02 WATER APPLICATION**

- A. Water shall be applied with equipment consisting of water supply, tank, pumps, hoses and fog nozzle.

- B. Arrange fog nozzle and spray pattern to provide complete coverage of the structures/debris with amended water.

**3.03 RESIDUE CONTROL**

- A. The Contractor shall be responsible to coordinate with the Owner and Commissioner for the removal and disposal of earthen material that is tracked on to site and off-site paved roadways by construction vehicles.
- B. The Contractor shall continuously inspect roadways and remove the materials immediately to maintain a clean and hazard-free driving surface.

**END OF SECTION**

**NO TEXT ON THIS PAGE**

**SECTION 015750**

**MAINTENANCE OF ONSITE FACILITIES**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

This section covers all labor, equipment and materials required to maintain, protect and secure all onsite facilities.

**1.02 SUBMITTALS**

- A. The Contractor shall submit product specifications and other data as necessary to prove compliance with the requirements specified herein.
- B. The Contractor shall submit layout drawings of barricades and enclosures required to protect onsite facilities upon request by the Construction Manager.

**PART 2 - MATERIALS**

Fireproof lumber or galvanized iron sheets, studs, sills, plates, required nailing strips, 20 gauge galvanized iron and other materials shall be used for protection of onsite facilities.

**PART 3 - EXECUTION**

**3.01 GENERAL**

The Contractor shall make use of such methods of work as are best adapted to preserve the safety and stability of all parts of the onsite facilities. The Contractor shall prevent any disturbance or damage at his own cost, and he shall make good any damage which may, in the course of construction, be done to any parts of the onsite facilities.

**3.02 WORK AFFECTING THE ONSITE FACILITIES**

The onsite facilities must be in use and may be in continuous operation during the performance of the work herein. This contract contemplates that the work herein shall be done without interruption of or change in the regular schedule of operations of the onsite facilities. No work shall be done on or affecting the onsite facilities until the Contractor has secured written permission to proceed from the Construction Manager. In addition, the Contractor shall submit for approval a weekly schedule of work he intends to perform in or about the onsite facilities for the following week. The schedule shall list the details of work proposed. Such weekly work schedules shall be submitted for approval 5 working days before the work shall be actually performed.

**3.03 BARRICADES AND ENCLOSURES**

- A. As part of the work of supporting, maintaining and protecting the onsite facilities, the Contractor shall provide tight, dustproof, weatherproof, watertight, structurally sound and properly secured barricades and shields with provisions for drainage. The barricades and

enclosures shall provide the necessary physical protection for the onsite facilities and equipment during the period when portions of the onsite facilities are removed and subsequently reconstructed. Plans of barricades and shields shall be submitted for approval.

- B. All equipment must be protected from the work inside the onsite facilities when cleaning and painting. The Contractor shall submit the method of protection to the Construction Manager for approval. The enclosures shall be constructed to provide access for the removal, replacement, maintenance and operation of the equipment.
- C. Barricades and enclosures at the onsite facilities shall be constructed of a framework of studs, sills and plates. Studs shall be two inches by four inches and shall be braced midway between the sills and plates. Nailing strips shall be provided where required for securing the fireproof lumber or galvanized iron sheets. Galvanized iron sheets shall be No. 20 gauge and shall be placed on the outer face of the enclosure. Fireproof lumber shall be not less than 1/4-inch in thickness and in the manufacturer's largest standard sized sheets. Studs shall be spaced 16 inches on centers and shall be diagonally braced at all corners. Barricades and enclosures shall extend from floor to ceiling and shall be dust tight, neat in appearance and painted as directed by the Construction Manager. Where the barricade covering comes into proximity to live equipment, the covering shall be of fireproof lumber.
- D. Upon the completion of the work, all barricades shall be removed and any damage to the onsite facilities caused by the construction and maintenance of said barricades shall be repaired and the surfaces restored to a condition equal to or better than that which existed prior to the commencement of the Work.

#### **3.04 TEMPORARY PROTECTION**

Temporary protection shall be provided to keep buildings watertight and weather tight at all times. Protection shall also be supplied when necessary to prevent vandalism and unauthorized entry.

**END OF SECTION**

**SECTION 017400**

**WASTE CHARACTERIZATION, REMOVAL, AND DISPOSAL**

**PART 1 – GENERAL**

**1.01 DESCRIPTION**

- A. Characterize, remove, and dispose of bulk chemical storage tanks, drummed liquid/solid wastes, water, sludges/sediment in pits, sumps or basements and other potentially contaminated materials identified prior to or during demolition. The following specific waste materials have been identified in Building 9 (Boiler Building), Building 9A (Tank Farm), Building 10 (Pump House) and the structural pipe bridge that will require proper characterization, removal and off-site disposal:
  - 1. Asbestos-containing materials.
  - 2. Florescent light fixtures/switches.
  - 3. Miscellaneous pails/drums, chemicals solvents and other hazardous materials.
  - 4. Lead based paint.
  - 5. Electric transformers and capacitors potentially containing PCBs.
  - 6. Sludge/sediment within the 70,000-gallon ASTs and in the secondary containment structure for the 70,000-gallon ASTs.
- B. Any soil excavation required to complete the work specified in this Contract shall be conducted assuming the soil is "contaminated historic fill" and will require off-site disposal.
- C. Any groundwater removed from the site for dewatering or other construction related activities may contain petroleum-related compounds which will require off-site disposal or treatment prior to discharge.
- D. Provide additional protection and services as specified herein.

1.02 RELATED SECTIONS

SECTION: DEMOLITION

SECTION: REMOVAL OF UNDERGROUND STORAGE TANKS

1.03 SCOPE OF WORK

- A. Characterize, remove, and properly dispose of materials from all areas in the project and as specified on the construction drawings.
- B. The following additional materials, which may present special waste characterization and disposal requirements, have been identified within the project site:
  - 1. Based on the age of the structures and the types of painted surfaces located throughout the buildings to be demolished, it is assumed that all surface paints contain lead.
  - 2. Debris in pits, sumps, floor drains throughout the facility may contain unspecified contaminants.
  - 3. Due to the nature and classification of the asphalt batch plant, petroleum based asphaltic material, solids, soils, and water are likely to be present within or surrounding the facility. Sediment and/or sludge may be present within the secondary containment structure adjacent to the four 70,000-gallon ASTs requiring demolition and off-site disposal. The Contractor shall properly characterize, transport and dispose of said sediment/sludge.
  - 4. Historical data and a recent inventory of electrical equipment indicated the potential presence of transformers, capacitors, and lighting with Polychlorinated biphenyls (PCB) containing components.
- C. Complete the removal and characterization of the materials described in this Section prior to the general demolition of the structure and prior to any other work of this Contract which may result in the disturbance of these materials. Treat all materials as hazardous unless testing demonstrates otherwise. None of the materials described in this Section shall be buried or left in place during this demolition project.
- D. These materials are located within and along the surfaces of the structures to be demolished. Certain other areas may be structurally unsafe, and the facilities are not well secured. Carefully and deliberately plan the work to avoid danger to workers and the



public. Employ other contractors and equipment as required to support the structure during the demolition.

- E. In addition to the wastes specifically described in this Section and referenced documents, other unanticipated wastes (which cannot be classified as clean fill or uncontaminated construction and demolition debris) may be encountered during this work which may require reporting, notification, and characterization prior to removal or disposal.
- F. Provide security as required to protect facilities. Remove segregated waste materials each day to a secure location to prevent vandalism of containers.

#### 1.04 REGULATIONS

- A. Comply with applicable federal, state, municipal, and local regulations including, but not limited to, the following:
  - 1. U.S. Environmental Protection Agency (EPA), including Title 40, Code of Federal Regulations.
  - 2. Occupational Safety and Health Administration (OSHA), including Title 29, Code of Federal Regulations, and Parts 1910 and 1926, OSHA, U.S. Department of Labor.
  - 3. State of New York Rules and Regulations, including 6 NYCRR Part 360 and 364 regarding transport and disposal.
  - 4. Recommendations of the National Institute of Occupational Safety and Health (NIOSH).
  - 5. Transportation regulations, including U.S. Department of Transportation regulations, including Title 29 Parts 171 and 172 and New York State Department of Transportation rules and regulations.
  - 6. Applicable federal, state, and local government regulations.
  - 7. Industrial Code Rule 56.
- B. Disposal sites for all wastes shall be appropriately permitted by the State in which the facility is located to accept such material.

- C. Whenever there is a conflict or overlap of the above references, the most stringent provision is applicable.
- D. In the event that any requirement of this specification contradicts any such requirement, immediately notify the Owner of such conflict or contradiction. In such cases, the regulation or law shall apply.
- E. Post all applicable regulations in a conspicuous place at the jobsite. Assure that the regulations are not altered, defaced or covered by other materials.

#### 1.05 EMPLOYEE TRAINING REQUIREMENTS

Permit only persons with "40-hour" OSHA training in accordance with 29 CFR 1910.120 to participate in work involving the segregation and removal of the materials identified in this Section.

#### 1.06 SUBMITTALS AND NOTICES

- A. Prior to Commencement of Work, submit the documents described in this sub-section to the Owner. Submittals must be bound together in one labeled, indexed submittal. See also general submittal requirements.
- B. Begin no work until the following documents have been reviewed and accepted:
  - 1. A complete description of the Contractor's work plan, laying out the sequencing and phasing of the work to ensure the proper removal, characterization, and disposal of all special wastes.
  - 2. Evidence of the completion of 40-hour OSHA training by Contractor's personnel.
  - 3. Copies of insurance certificates for all Contractors on site, with limits as identified elsewhere in these specifications.
  - 4. Proof that all required permits, disposal site locations, and arrangements for transportation and disposal of wastes have been addressed and obtained.
  - 5. At the end of the removal and characterization of all special wastes, but at least five days prior to application for payment for this work, provide records showing final disposition of all special wastes removed from the project site (see also Part 3 of this Section for waste manifest requirements).

#### 1.07 PROTECTION OF CONTRACTOR'S PERSONNEL

The Contractor is solely responsible for the protection of his work force, in accordance with federal and state regulations. Worker protection shall include personnel protective equipment (including respiratory protection), at a minimum. In addition, protection from other hazards inherent in demolition and tank projects shall be provided, including temporary shoring and support for building structural elements, as required.

#### 1.08 DISPOSAL ACTIVITIES

- A. It is the responsibility of the Contractor to comply with current federal, state and local regulations concerning the waste handling, transportation, and disposal of all wastes removed as part of this project.
- B. The Contractor shall provide a certified letter at the conclusion of work stating that all special wastes removed from the project site were disposed of properly, and with attachments to that letter providing proof of actual disposal of the waste at the designated landfill.

#### PART 2 – MATERIALS AND EQUIPMENT

(Not Used)

#### PART 3 – EXECUTION

##### 3.01 TEMPORARY POWER AND LIGHTING

- A. Provide temporary power for equipment and lighting within the work area as defined by all governing regulations and codes. Ensure safe installation and use of power and lighting within the work site per applicable electrical code requirements. Provide safety lighting and ground fault interrupter circuits.
- B. The Owner's power may be partially or wholly disengaged and is not available for Contractor's use.

##### 3.02 WORK BARRIERS

In addition to other barriers specified elsewhere, provide appropriate work barriers for the protection of the public from environmental concerns that may result from the removal and disposal of the materials identified in this Section.

**3.03 NOTIFICATION, RESPONSE, WASTE CHARACTERIZATION, HANDLING, REMOVAL, AND DISPOSAL**

**A. General**

1. Demolition and excavation activities at the structures will generate spoils materials that will require proper handling procedures for reuse or disposal. In accordance with 6 NYCRR Part 360 and 6 NYCRR Part 371, spoils material can be classified as "clean fill" (unregulated solid waste) or into several categories, as follows:
  - a. Construction and Demolition Debris (C&D)
  - b. Non-hazardous Industrial Solid Waste
  - c. Hazardous Solid Waste
2. Some of the materials likely to be encountered have been identified herein. The Characterization, Handling, Removal and Disposal of those materials, of all "clean fill", of other C&D materials, and of other identified wastes shall be considered part of the Contract bid price.
3. For materials encountered which were not anticipated or identified and which cannot be classified as "clean fill" or C&D wastes, the visual and field characterization and handling of such wastes shall also be considered part of the Contract bid price. However, should these unanticipated and unidentified materials be found to be Non-hazardous Industrial Solid Wastes or Hazardous Solid Wastes, the additional cost of laboratory testing for waste characterization, transportation, and disposal of these materials above and beyond the transportation and disposal costs associated with C&D materials, shall be considered an addition to the bid price and subject to additional payment in accordance with the Change Order provisions of this Contract.

**B. Identification of Wastes**

1. The Contractor has the initial responsibility for identifying wastes on site. During routine demolition and excavation activities, materials encountered and spoils generated are normally expected to be classified C&D (other than the wastes known to be present and discussed in Section 1.01 and other locations in the technical specification). The Contractor shall be familiar with such materials and shall handle them in accordance with their standard operating procedures. When Contractor personnel encounter materials that do not meet the definition of C&D, an evaluation shall be performed. At this point the Contractor shall cease

work in the area (continuing work in other areas without claim for delays) and notify any of the designated representatives of the Owner.

2. A report form with a suitable sequenced numbering system shall be generated and used by the Contractor to identify such discoveries. Copies of the report shall be sent to the Commissioner and the Owner by hand or by facsimile.
3. Within 48 hours of notification, a representative of the Owner will visit the site to inspect the waste materials. The inspection will include visual observation, identification of noticeable odors, and/or field screening using a photoionization detector (PID), or similar procedure, as appropriate to the circumstance.
4. Based on the information available, an opinion will be formulated regarding the classification of the materials in question. This response will cover two basic cases; namely, (1) materials which appear to be uncontaminated C&D as a result of the screening, and therefore should be handled as C&D, and (2) materials which may not meet the criteria for C&D, and therefore require further characterization.
5. In addition to internal notification requirements, federal and state regulations may require notification and reporting to various regulatory agencies. Whenever practical, such reporting shall be coordinated through the Owner's representative. The Contractor shall be knowledgeable of such reporting requirements and work to ensure that such reporting meets the requirements of the appropriate regulatory body.
6. For materials which were not identified prior to the start of Construction, which cannot be classified as unregulated clean fill or C&D or visually identified as other non-hazardous wastes (such as tires, carpeting, or corrugated containers) and for which further characterization is required prior to disposal, the Contractor shall arrange and pay for laboratory testing as necessary, such costs being considered as an additional cost in accordance with a Change Order provisions of this Contract. However, the Owner reserves the right to use the Owner's own qualified persons; or laboratories at any time to exclude certain areas or materials from the Contract scope, or to take other similar cost-savings measures as determined prudent by the Owner at any-time.
7. The "overhead" costs of the entire characterization process shall be considered part of the bid price. Only laboratory and other specialty services and the transport and disposal of materials subsequently found to be non-hazardous or hazardous industrial solid wastes not previously identified in the Contract shall be eligible for consideration as an addition Change Order cost.

8. As practical, the Owner's Representative will assist in resolving questions regarding appropriate characterization requirements.
9. For these additional materials only, additional characterizations required by disposal facilities which are above and beyond the requirements of state and federal regulators shall be subject to negotiation. The Owner may require information from several disposal facilities and may direct use of alternate facilities when use of alternate facilities could result in a reduced cost to the Owner.

**C. Clean-Up or Removal Responses**

1. Should an immediate clean-up or removal response be required in order to reduce the likelihood of further waste migration or to allow completion of critical construction tasks, the Owner will direct such response either by Change Order or by use of the Owner-contracted forces and equipment.
2. The Contractor shall be prepared with the appropriate personnel, equipment, and materials for any of the following three types of immediate responses:
  - a. Application of sorbents or neutralizers for liquid wastes.
  - b. Pumping and containerizing of liquid wastes.
  - c. Excavation and containerizing of solid wastes.
3. Based on the effectiveness of the immediate response and appropriate analytical testing, as required, the Contractor and Owner will determine whether operations can continue in the vicinity of the waste.

**D. Waste Storage, Disposal, and Recordkeeping**

1. All wastes shall be removed from site as soon as lawful and practical, remaining on site for only so long as necessary to properly characterize the wastes.
2. All wastes shall be disposed of in accordance with local, state, and federal law.

3. Establish and perform routine and continuous recordkeeping to document the disposal of all wastes as described herein and to document the response actions for any uncovered waste materials which cannot be classified either as unregulated clean fill or as construction and demolition debris.

**3.04 WASTE MANIFEST**

**A. Waste Manifest System**

1. Establish a manifest system that accounts for all wastes identified herein. Describe the manifest system in writing for review and acceptance by the Owner. Demonstrate custody over all wastes from the time the waste is removed from the work area until it is deposited at the landfill.
2. Provide final manifest and documents to the Owner within three (3) working days of the removal of wastes from the site by the waste hauler.
3. Remove all containerized waste from the site as soon as practical and legal to do so.
4. Properly dispose of all wastes.

**END OF SECTION**

**NO TEXT ON THIS PAGE**



**SECTION 017823**

**OPERATING AND MAINTENANCE DATA**

**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 operating and maintenance data as specified herein.

**1.3 RELATED SECTIONS**

- A. Submittals - Section 013300.
- B. Contract closeout - Section 017300.

**1.4 GENERAL**

- A. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under the Contract.
  - 1. Sub-Contractors shall prepare operating and maintenance data as specified in this Section and as referenced in other pertinent sections of Specifications.

**1.5 FORM OF SUBMITTALS**

- A. Prepare data in the form of an instructional manual for use by Owner's personnel.
- B. Format
  - 1. Size: 8-1/2 x 11 in.
  - 2. Paper: 20 pound minimum, white for typed pages.
  - 3. Text: Manufacturer's printed data, or neatly typewritten.
  - 4. Drawings
    - a. Provide reinforced punched binder tab, bind in with text.
    - b. Fold larger drawings to the size of the text pages.

5. Provide fly-leaf for each separate product, or each piece of operating equipment.
  - a. Provide typed description of product, and major component parts of equipment.
  - b. Provide indexed tabs.
6. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:
  - a. Title of Project.
  - b. Identity of separate structure as applicable.
  - c. Identity of general subject matter covered in the manual.

**C. Binders**

1. Commercial quality three-ring binders with durable and cleanable plastic covers.
2. Maximum ring size: 1 inch.
3. When multiple binders are used, correlate the data into related consistent groupings.

**1.6 MANUAL FOR MATERIALS AND FINISHES**

- A. Submit two copies of complete manual in final form.
- B. Content, for architectural products, applied materials and finishes
  1. Manufacturer's data, giving full information on products.
    - a. Catalog number, size, composition.
    - b. Color and texture designations.
    - c. Information required for re-ordering special-manufactured products.
  2. Instructions for care and maintenance.
    - a. Manufacturer's recommendation for types of cleaning agents and methods.
    - b. Cautions against cleaning agents and methods which are detrimental to the product.
    - c. Recommended schedule for cleaning and maintenance.
- C. Content, for moisture-protection and weather-exposed products
  1. Manufacturer's data, giving full information on products.
    - a. Applicable standards.
    - b. Chemical composition.

c. Details of installation.

2. Instructions for inspection, maintenance, and repair.

**1.7 MANUAL FOR EQUIPMENT AND SYSTEMS**

A. Submit three copies of complete manual in final form.

B. Content, for each unit of equipment and system, as appropriate.

1. Description of unit and component parts.

- a. Function, normal operating characteristics, and limiting conditions.
- b. Performance curves, engineering data and tests.
- c. Complete nomenclature and commercial number of all replaceable parts.

2. Operating procedures

- a. Start-up, break-in, routine and normal operating instructions.
- b. Regulation, control, stopping, shut-down and emergency instructions.
- c. Summer and winter operating instructions.
- d. Special operating instructions.

3. Maintenance procedures

- a. Routine operations.
- b. Guide to "trouble-shooting".
- c. Disassembly, repair and reassembly.
- d. Alignment, adjusting and checking.

4. Servicing and lubrication schedule.

- a. List of lubricants required.

5. Manufacturer's printed operating and maintenance instructions.

6. Description of sequence of operation by control manufacturer.

7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.

- a. Predicted life of parts subject to wear.
- b. Items recommended to be stocked as spare parts.

8. As-installed control diagrams by controls manufacturer.

9. Each contractor's coordination drawings.

- a. As-installed color coded piping diagrams.

10. Charts of valve tag numbers, with the location and function of each valve.
  11. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
  12. Other data as required under pertinent sections of specifications.
- C. Content, for each electric and electronic system, as appropriate:
1. Description of system and component parts.
    - a. Function, normal operating characteristics, and limiting condition.
    - b. Performance curves, engineering data and tests.
    - c. Complete nomenclature and commercial number of replaceable parts.
  2. Circuit directories of panel boards.
    - a. Electrical service.
    - b. Controls.
    - c. Communications.
  3. As-installed color coded wiring diagrams.
  4. Operating procedures
    - a. Routine and normal operating instructions.
    - b. Sequences required.
    - c. Special operating instructions.
  5. Maintenance procedures
    - a. Routine operations.
    - b. Guide to "trouble-shooting".
    - c. Disassembly, repair and reassembly.
    - d. Adjustment and checking.
  6. Manufacturer's printed operating and maintenance instructions.
  7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
  8. Other data as required under pertinent sections of specifications.
- D. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.
- E. Additional requirements for operating and maintenance data: The respective sections of Specifications.

END OF SECTION

**SECTION 020100**

**PROTECTION OF EXISTING FACILITIES**

**PART 1 – GENERAL**

**1.00 DESCRIPTION**

The work specified in this Section consists of the labor, equipment, tools, materials, and services needed to provide complete protection of all existing facilities during construction operations.

- A. Work included in this Section:
  - 1. Location of Facilities.
  - 2. Notification of Owners and Authorities.
  - 3. Coordination and Preparation.
  - 4. Protection of Facilities.
  - 5. Relocation of Facilities.
  - 6. Restoration of Property Markers.

**PART 2 – PRODUCTS (Not Applicable)**

**PART 3 – EXECUTION**

**3.01 LOCATION OF FACILITIES**

- A. Prior to commencement of work, verify location of existing underground facilities near or adjacent to project.
  - 1. Consult with owners of facilities and arrange for field stake-out or other markings to show locations.
  - 2. Perform exploratory excavation at key junctures and other critical points to aid in ascertaining locations.
- B. Report field stake-out findings and results of exploratory excavations to the Commissioner if possible changes in project location or design are indicated because of suspected interferences with existing facilities. Allow the Commissioner sufficient time to determine magnitude of changes and to formulate instructions in that regard.
- C. If location of existing underground facilities is uncertain, apply careful excavation and probing techniques during construction to locate and avoid damage to same.

**3.02 NOTIFICATION OF OWNERS AND AUTHORITIES**

- A. Prior to construction, notify owners of existing facilities, including local Police and Fire Departments, of general scope, nature and planned progress schedule of the Work.

- B. When existing utilities, such as sewer, water, gas, telephone or electric power are damaged or disturbed during demolition, immediately notify affected owner, and the Commissioner.
- C. Notify Police and Fire Departments, including affected owners, immediately if hazardous conditions are created or have the potential for occurring, as a result of damage to an existing facilities or as a result of other activities at project site. Hazardous conditions could be created from: fire, explosion, escape of gas, escape of fuel oil, gasoline or industrial fluids, downed electrical wires, and disrupted underground electrical cables.

### 3.03 COORDINATION AND PREPARATION

Make preparations beforehand to repair and restore damaged utilities, including arrangements for standby materials and equipment to be promptly assembled at site and utilized immediately.

### 3.04 PROTECTION OF FACILITIES

- A. Plan and conduct demolition operations so that operation of existing facilities near or adjacent to the Work, including electric, telephone, sewer, water, gas or drainage utilities, are sustained insofar as the requirements of the project will permit.
- B. Protect existing facilities from damage or movement through installation of adequate support systems and use of proper equipment, including application of careful excavation and backfilling techniques in sensitive areas.
- C. Existing utilities and other facilities which are damaged by the Contractor during operations shall be promptly repaired by Contractor to the satisfaction of the utility owner or, if he so elects, the utility owner will perform the repairs with his own forces. Under either arrangement, such repair work shall be done at Contractor expense.
- D. When aboveground visible facilities such as poles, wires, cables, fences, signs or structures constitute an unavoidable interference, notify the Commissioner and utility owner regarding temporary removal and later restoration of the interfering item. Arrange with the Commissioner and utility owner to remove and later restore the interfering item to the satisfaction of the utility owner, subject to approval of the utility owner, or, allow the utility owner to perform such work with his own forces. Under either arrangement, such work shall be done at Contractors expense.
- E. Take all necessary precautions to prevent fires at or adjacent to the work, buildings, and other facilities. No burning of trash or debris is permitted. Fire extinguishers are to be easily accessible in case of equipment fires, etc. and are to be maintained as required by OSHA.

**3.05 RELOCATION OF FACILITIES**

- A. If the location or position of an existing gas pipe, water pipe, sewer, drain, conduit, or structure requires its removal, realignment or change, such alteration shall be completed without cost to the Contractor for the work of removal, provided the work was not included in the contract documents.
- B. Uncovering, supporting and sustaining such facilities before its removal or before and after its realignment or change, shall be the Contractor=s responsibility as part of the Work of this Contract.

**3.06 RESTORATION OF PROPERTY MARKERS**

- A. Property corner markers, boundary monuments, etc., disturbed or moved by the Contractors operation shall be restored, in conformance with the property deed description, by a licensed land surveyor. Restoration of the property corner markers or boundary monuments shall be certified by said surveyor on a map prepared by him which shows the work accomplished. One copy of the map shall be given to the property owner and one copy given to the Commissioner.

**END OF SECTION**

**NO TEXT ON THIS PAGE**



**SECTION 024116**

**DEMOLITION-BOILER PLANT AND DIESEL FUEL SYSTEM**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

- A. The Contractor shall furnish all labor, materials, and equipment required for demolition of items indicated on the Contract Drawings or as directed by the Construction Manager.
- B. The Contractor may salvage any materials designated for demolition. The City of New York will not be compensated by the Contractor for any salvaged materials. All salvage and reprocessing operations shall be performed off-site.
- C. Dispose of all demolition material off-site in a permitted facility.

**1.02 RELATED WORK**

SECTION: EXCAVATION  
SECTION: FILLING, BACKFILL AND COMPACTING FOR STRUCTURES  
SECTION: WASTE CHARACTERIZATION, REMOVAL, AND DISPOSAL  
SECTION: REMOVAL AND DISPOSAL OF INDUSTRIAL WASTE

**1.03 APPLICABLE REFERENCES**

The publications listed below form part of this Specification to the extent referenced. The publications are referred to in the text by basic designation and shall be the latest published version.

- A. Building Code of the City of New York.

**1.04 SUBMITTALS**

The procedures proposed for the accomplishment of salvage and demolition work shall be submitted for approval. The procedures shall provide for safe conduct of work, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations.

- A. Demolition and Removal Work Plan, which shall detail all critical sequencing, procedures, demolition methods, temporary protection and control methods, and schedule.
- B. Record documents showing locations of remaining and newly installed underground utilities, structures, and appurtenances.

**1.05 EXISTING CONDITIONS**

- A. Using all reasonable precautions, inspect structures carefully prior to start of work. Protect workers from all hazardous conditions inherent in demolition of structurally deteriorating structures.
- B. The structures contain asbestos and various incompletely characterized waste materials which will be removed and disposed of prior to general building demolition (see Specification Section 028213).
- C. Occupancy:
  - 1. All structures are presently vacant.
- D. Condition of Structures:
  - 1. Owner assumes no responsibility for actual condition of structures to be demolished.
  - 2. Conditions existing at the time of inspection for bidding purpose will be maintained by the Owner insofar as practicable. However, variations within the structures may occur prior to the start of demolition work.
- E. Salvaged Material:

The Contractor may salvage any materials designated for demolition. The City of New York will not be compensated by the Contractor for any salvaged materials. All salvage and reprocessing operations shall be performed off-site.
- F. Pre-Demolition Survey:
  - 1. Prior to any demolition activity, the Contractor shall perform a condition survey of existing structures and other items to remain, including but not limited to buildings, pavement, equipment, railroad tracks, and appurtenances. The survey shall consist of a visual inspection and recording by notes, photographs, and videotape of cracks or other structural damage previously sustained, and shall be conducted by a qualified technician under the direct supervision of a Professional Engineer, acceptable to the Owner. The records so obtained shall be retained in the Contractor's file for at least one year after completion of the Contract. In the event of damage claims, a report on the pre-construction conditions shall be

prepared by the Contractor for the particular structures as requested by the Commissioner from those notes and photographs.

**1.06 PERMITS**

Prior to execution of the demolition work, obtain and pay all costs of all necessary permits.

**1.07 NOTIFICATION**

Prior to execution of the demolition work, notify local Police and Fire Department.

**1.08 PROTECTION**

During the work under this Contract:

- A. Upon issuance of the Notice To Proceed, the Contractor shall take possession of the site and buildings included the work, and secure them by installation of a site fence. Liability of structures, site, and utilities becomes the responsibility of the Contractor.
- B. Provide, maintain and remove all temporary protection necessary to carry out the work in a safe and orderly manner and in compliance with applicable regulations.
- C. Traffic: Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied facilities and used facilities.
  - 1. Do not close or obstruct streets, walks, or other occupied or used facilities without the permission from the Commissioner.
- D. Protections: Ensure safe passage of persons around area of demolition. Conduct operations to prevent damage to adjacent buildings, structures, pavements, and other facilities and injury to persons.
  - 2. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structures to be demolished and adjacent facilities to remain.
  - 3. Provide temporary structures and screenings to protect existing structures to remain.

4. All shoring, bracing, support or screening structures shall be included in the Work Plan identified and shall bear the seal of a Professional Engineer Licensed in the State of New York.
5. Damages: Promptly repair damages caused to adjacent facilities by demolition operations.
6. Utility Services: Maintain existing utilities indicated to stay in service and protect against damage during demolition operations. Terminate any existing utilities that presently service the portion of the facility to be demolished. Termination shall be made at the property line noted on the record plans.

## **PART 2 - PRODUCTS**

### **2.01 GENERAL**

Materials for temporary screening structures and shoring may be new or used provided they are adequate in capacity for the required usage.

## **PART 3 - EXECUTION**

### **3.01 PROCEDURE AND TIMING**

#### **A. Procedure**

Execute the work in an orderly and careful manner with due consideration for employees, the public, and active operations in adjacent facilities and areas at all times, with necessary signs, lights, bracing and guards for the protection of all personnel, existing facilities, and the public.

#### **B. Timing**

Remove identified or discovered hazardous materials prior to demolishing structures.

Coordinate work to facilitate scheduling of demolition work, to allow for utility disconnection, and to allow for the installation of temporary services, if required. All work shall be scheduled in advance at a meeting with the Owner's Representative to coordinate work schedules.

### **3.02 DUST CONTROL**

- A. Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and debris from rising and scattering in air. Comply with governing regulations pertaining to environmental protection.

1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.
- B. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.

### 3.03 DEBRIS CONTROL

The Contractor shall employ all necessary means to prevent debris from leaving the site and entering adjacent properties. Any debris entering adjacent properties due to the demolition work shall be collected and removed by the Contractor immediately. All costs are to be borne by the Contractor.

### 3.04 VIBRATION CONTROL

- A. Vibration monitoring by a qualified specialist, acceptable to the Commissioner, shall be retained to observe vibrations. A seismograph shall be employed to measure ground vibrations near selected typical private and/or public buildings within the range of influence of the work. The recorded information shall be adequate to allow determination of the peak ground particle velocity and energy ratio at the seismograph location. The recorded data is to be analyzed by the specialist on a weekly basis or more frequently as directed by the Owner. Contractor's foreman and Owner's Representative are to be trained by the specialist and/or manufacturer's representative to observe and interpret incidents of significant vibration. Should they occur, the Contractor will be directed to stop work and revise operating procedures to eliminate or reduce to acceptable levels vibration-causing impacts.
- B. Demolition procedures shall be adjusted so that the ground vibrations in the vicinity of existing structures or structures erected under this Contract are below the levels generally recognized as damage producing. In no event shall impact intensity be so high as to produce peak particle velocities greater than two inches per second or energy ratios greater than 1.0 in the vicinity of existing structures.

1. Energy Ratio shall be calculated by the following formula:

$$E.G. = (3.29FA)^2$$

Where: F = Frequency in cycles per second  
A = Amplitude in inches

Total E.G. is equal to the arithmetical sum of the Energy Ratios in three mutually perpendicular planes of motion in the vertical and horizontal directions at any one instant of time.

2. Particle Velocity shall be calculated by the following formula:

Particle Velocity (v) = A/t

Where:           A = Amplitude in inches  
                  t = Time in seconds

Total peak particle velocity is equal to the vector sum of the particle velocities in three mutually perpendicular planes of motion in the vertical and horizontal directions at any one instant of time.

**3.05 STORMWATER RUNOFF CONTROL**

- A. Contractor shall provide and install all necessary material to prevent surface stormwater runoff from the work site and debris from entering the existing stormwater system.
- B. The Contractor is advised that water is present in pits, sumps and basement(s) of some of the structures to be demolished. In some cases, it may be necessary to dispose of this water.

**3.06 UTILITIES**

- A. Prior to execution of the demolition work, consult with pertinent utility companies regarding approved methods of terminating existing utility lines running to structures to be demolished. Contact NYC/LI New York City and Long Island – One Call Center, UFPO (Underground Facilities Protection Organization) to locate utilities within the project area.
- B. Prior to proceeding with the demolition work, disconnect and properly terminate all utility services connected to structures to be demolished. This includes but is not limited to electricity, gas, telephone, water and sewers.

**3.07 DEMOLITION**

- A. Prohibited Procedures:
  - 1. Do not burn debris on the site.
  - 2. Do not allow debris to enter adjacent properties.
- B. Building Demolition:
  - 1. Demolish buildings completely as shown on the drawings and remove from site. Use such methods as required to complete work within limitations of governing regulations.

2. Locate demolition equipment throughout structure and remove materials so as to not impose excessive loads to supporting walls, floors, framing, or adjacent foundation structures.

**3.08 FILLING BASEMENT AND VOIDS**

- A. Completely fill below-grade areas and voids resulting from demolition of structures, as noted on drawings.
- B. Use acceptable fill materials as defined in SECTION: FILLING, BACKFILLING AND COMPACTING FOR STRUCTURES.
- C. Prior to placement of fill materials, ensure that areas to be filled are free of standing water, asbestos, frost, frozen material, trash and debris.
- D. Place fill materials in accordance with SECTION: FILLING, BACKFILLING AND COMPACTING FOR STRUCTURES.
- E. After fill placement and compaction, grade surface to meet adjacent contours and to provide flow as indicated on plans.
- F. Finished Surface: The top fill layer material shall consist of crushed stone conforming to the NYCDOT Standard Highway specifications.

**3.09 SALVAGED MATERIALS**

- A. Material for Contractor Salvage

The Contractor shall store salvageable material as directed by the Construction Manager. Salvage materials shall be removed from New York City property prior to completion of the Contract. Material for salvage shall not be sold on the site.

- B. Unsalvageable Materials

All unsalvageable items shall be removed from the site and disposed of. The Contractor has the responsibility for all costs and to obtain all permits necessary to accomplish this portion of the work.

- C. Materials for New York City Salvage

The Contractor shall remove salvaged items in a manner to prevent damage. The Contractor shall pack or crate in a manner to protect the items from damage in storage or shipment and properly identify crates as to contents.

1. Remove carefully to avoid damages.
2. Transport all materials identified to be salvaged to area(s) designated by the Owner on the Owner's property.
3. Except for items indicated to be retained as Owner's property, other removed and salvaged materials not indicated for reuse shall become Contractor's property and removed from site with further disposition at Contractor's option.

### 3.10 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove continuously from site accumulated debris, rubbish, and other materials resulting from demolition operations.
- B. Remove all material, equipment and debris not indicated to be salvaged from the site and legally dispose of it.

### 3.11 CLEANING

- A. The Contractor shall remove debris and rubbish from the site daily. The Contractor shall not allow debris or rubbish to accumulate in buildings or on site. The Contractor shall remove debris from all excavations.
- B. The Contractor shall remove and transport debris in a manner as to prevent spillage on streets or adjacent areas.
- C. The Contractor shall dispose of all material in accordance with Federal, State and New York City Regulations.
- D. Upon work completion, remove from the site all tools, material, plant and rubbish of every sort created by work of this section. Leave premises neat and orderly.

END OF SECTION



**SECTION 024119**

**SELECTIVE DEMOLITION AND ALTERATION WORK**

**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 selective demolition and alteration work as shown on the drawings and/or specified herein, including, but not limited to, the following:
  - 1. Alterations, selective demolition, and removals as noted on drawings and as required to accommodate new construction.
  - 2. Removal of debris.
  - 3. Protection of existing building and spaces to remain and shoring of the structure as required for structural integrity and personal safety.
  - 4. Protection of existing curbs and sidewalks.
  - 5. Temporary coverage passageways.
  - 6. Patching and refinishing of existing surfaces damaged as a result of this work.
  - 7. Protection.

**1.3 QUALITY ASSURANCE**

- A. The Contractor shall comply with the requirements of all applicable Federal, State and local safety and health regulations regarding the demolition of structures, including ANSI/NFPD 241-Building Construction and Demolition Operations.
- B. The Contractor shall be responsible for any damage to any adjacent structures or buildings to remain.
- C. Qualifications: Qualifications of Contractor for work of this Section shall not be less than three (3) years of field experience in work of this nature.
- D. Professional Engineering: The Contractor shall retain the services of a Professional Engineer licensed in the State of New York, who shall design and supervise installation of all underpinning and shoring.

## **HARPER STREET YARD**

FMS ID# HWQF027C

### **1.4 RELATED SECTIONS**

- A. Alteration and removal requirements for mechanical and electrical work - Mechanical and Electrical Sections.

### **1.5 SUBMITTALS**

- A. Schedule of Demolition Operations: Submit demolition procedures and operational sequence for Commissioner's review prior to start of work. Submit a written request to Commissioner well in advance of executing any cutting or alteration which affects:
  - 1. The work of tying in or connecting to operational systems of the building, including electrical, mechanical and security systems.
  - 2. The work of the City of New York or any separate Contractor.
  - 3. The structural value or integrity of any element of the project or of adjacent structures.
  - 4. The integrity or effectiveness of weather-exposed and moisture-resistant elements or systems.
  - 5. The efficiency, operational life, maintenance, or safety of operational elements or systems.
- B. Notice of Differing Conditions: Submit a written notification if, during the work of demolition and cutting, conditions are discovered which significantly vary from those shown on the drawings. Do not commence work until approval of Commissioner.
- C. Shop Drawings: Submit the following prior to starting work:
  - 1. Submit for Commissioner's information shop drawings indicating location and typical construction details of temporary dustproof and weatherproof partitions.
  - 2. Submit drawings of temporary structural shoring, bracing, framing, or support, for the information of the Commissioner. Such drawings will be reviewed by the Structural Engineer for the effect of such temporary members on the structural elements to remain. These drawings shall include the reason for such temporary members, the location, the direction and magnitude of design reaction forces on existing structure, and details showing how these reaction forces will be applied to the existing structure.
    - a. Shop drawings shall be submitted with the Seal of the P.E. engaged by Contractor; P.E. must be licensed in the State of New York.

- b. The Commissioner will receive acknowledgment for concepts shown. Such acknowledgments shall be of the concept only and not of actual capacities or structural design and shall not in any way diminish or limit the Contractor's responsibility for the quality and performance of the work and for protecting existing structures and facilities.

**1.6 SPECIAL PRECAUTION**

- A. Hazardous materials may be encountered during demolition operations including asbestos; comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.
- B. Refer to Asbestos Sections 028013 and 028213.

**1.7 JOB CONDITIONS**

- A. Condition of Structure
  - 1. The Contractor for the work of this Section shall be held to have visited the site, examined the premises, determined for himself the existing conditions, character of equipment and facilities needed for the performance of the work, and all matters which may in any way affect the work before submitting a bid.
    - a. Information regarding existing construction or conditions is based on available record drawings which may or may not truly reflect existing conditions. Such information is included on the assumption that it may be of interest to the Contractor, but the Commissioner, City of New York and their consultants do not assume responsibility for its accuracy or completeness.
    - b. Notify the Commissioner if, during the course of demolition, conditions are discovered which significantly vary from those shown on the drawings. Do not proceed until authorized by the Commissioner.
  - 2. The Contractor shall accept the condition of the site and structures as found. The Commissioner and City of New York assume no responsibility for condition of site or structures nor the continuation of the condition existing at time of bidding or thereafter.
- B. Areas of building to be demolished or altered will be vacated and discontinued in use prior to the start of the work.
  - 1. Surrounding areas of the building shall remain operational by the City of New York.

**C. Partial Removal**

1. Items of savable value to the Contractor may be removed from the structure as the work progresses. Salvaged items must be transported from the site as they are removed.
2. Storage or sale of removed items on the site will not be permitted.

**D. Explosives: The use of explosives will not be permitted.**

**E. Traffic**

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

**F. Utilities**

1. Refer to Divisions 22 and 26 of the specifications for special requirements concerning utilities and services.
2. Maintain any existing utilities required to remain; keep in service and protect against damage during demolition operations.
3. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to the governing authorities.
4. Disconnect and seal any abandoned utilities before starting demolition operations. Coordinate all work with local utility companies having jurisdiction.

**1.8 SCHEDULING**

- A. Before commencing any alteration or demolition work, submit for review by the Commissioner, and approval of the City of New York, a schedule showing the commencement, the order, and the completion dates for the various parts of this work.
- B. Before starting any work relating to existing utilities (electrical, sewer, water, heat, gas, fire lines, etc.) that will temporarily discontinue or disrupt service to the structures to remain, notify the Commissioner and the City of New York 7 days in advance and obtain the City of New York's approval in writing before proceeding with this phase of the work.

## **PART 2 PRODUCTS**

Refer to Part 3 - Execution, for Product Requirements

## **PART 3 EXECUTION**

### **3.1 PROTECTION**

- A. Take full precautions to protect workmen, passersby or any other persons from falling debris and other hazards of demolition operations.
- B. Execute demolition work to insure protection of existing portions of building to remain against damages which might occur from falling debris or other cause. Do not interfere with use of adjacent occupied buildings and areas. Maintain free, safe passage to and from occupied adjacent buildings.
- C. Materials Placement: Do not load structure with weight that will endanger, overload or cause excessive deflection of the existing structure, or that will damage finished surfaces adjacent to and/or supported by the existing structure, except portions being removed.
- D. Construction Operations: Do not employ any construction operation, equipment or vehicles that will endanger, overload or cause excessive deflection of the existing structure, or that will damage finished surfaces adjacent to and/or supported by the existing structure, except portions being removed.
- E. Take precautions to guard against movement, settlement, damage, or collapse of any part of building, sidewalks, adjacent property or street passages; be liable for any such movement, settlement or collapse. If such damage does accidentally occur, Contractor shall repair promptly at no cost to the City of New York.
- F. Provide the necessary safeguards to prevent accidents, to avoid all unnecessary hazards, and protect the public, the work, and property at all times, including Saturdays, Sundays, and holidays.
- G. Be responsible for any and all damages which may arise or occur to any party whatsoever by reason of the neglect in providing proper lights, guards, barriers, or any other safeguards to prevent damage to property, life, and limb.
- H. Make such explorations and probes as are necessary to ascertain any required protective measures before proceeding with demolition and removal. Give particular attention to shoring and bracing requirements so as to prevent any damage to existing construction.

1. Provide interior and exterior shoring, bracing, or support to prevent movement or settlement or collapse of structures to be demolished and adjacent facilities to remain. The Contractor's Professional Engineer shall advise on bracing, shoring, underpinning, or other structural requirements. The Contractor shall bear all responsibility for prevention of movement or other structural fault.
  2. The Contractor shall restore, by repair or otherwise, the portions of structure or their contents altered by the Contractor in furtherance of his underpinning and support operations. Restoration shall be completed to the conditions which existed prior to the start of the work. Any damage caused by inadequate support shall also be restored by the Contractor at no cost to the City of New York.
- I. Provide, erect and maintain catch platforms, lights, barriers, weather protection, warning signs, and other items as required for proper protection of the workmen engaged in demolition and alteration operations, occupants of the building, public, and adjacent property. Any damage caused by the Contractor's operations shall be promptly repaired by the Contractor at no cost to the City of New York.
  - J. Provide and maintain temporary protection of the existing structure designated to remain where demolition, removal, and new work are being done, connections made, materials handled, or equipment moved.
  - K. Take necessary precautions to prevent dust and dirt from rising. Protect unaltered portions of the existing building affected by the operations under this Section by dustproof partitions and other adequate means.
  - L. Provide adequate fire protection in accordance with local Fire Department requirements.
  - M. Do not close or obstruct walkways, passageways, or stairways. Do not store or place materials in passageways, stairs, or other means of egress. Conduct operations with minimum traffic interference.
  - N. Be responsible for any damage to the existing structure or contents by reason of the insufficiency of protection provided.
  - O. Erect temporary covered passageways at street level as required by authorities having jurisdiction.
  - P. Promptly repair damages caused to adjacent facilities by demolition operations at no cost to the City of New York.
  - Q. Provide and maintain weather protection at exterior openings so as to fully protect the interior premises against damage from the elements until such openings are closed by new construction.

### **3.2 INSPECTION**

- A. Verify that areas of demolition work are protected and temporary dustproof partitions have been installed.
- B. Verify that construction to be removed is not load bearing or has been properly braced, framed or supported.
- C. Inspect existing conditions of the project, including elements subject to damage or to movement during demolition and cutting.
- D. After uncovering work, inspect the conditions affecting the installation or performance of the work.
  - 1. Report differing or questionable conditions to the Commissioner in writing; do not proceed with the work until the Commissioner has provided further instructions.

### **3.3 PREPARATION**

- A. Provide adequate temporary support as necessary to assure the structural value or integrity of the affected portion of the work.
- B. Provide devices and methods to protect other portions of the project from damage.
- C. Pollution Controls
  - 1. Use water sprinkling, temporary enclosures, and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level. Comply with governing regulations pertaining to environmental protection.
    - a. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.
  - 2. Clean adjacent structures and improvements of dust, dirt and debris caused by demolition operations. Return adjacent areas to condition existing prior to the start of the work.
  - 3. Provide drainage for temporary water use.

### **3.4 DEMOLITION AND CUTTING**

- A. Selectively demolish existing construction in conformance with the drawings and these specifications.
  - 1. Execute cutting and demolition by methods which will prevent damage to other work and will provide proper surface to receive installation of work by others and patching of finish surfaces.

2. Do all cutting or removal so as to leave neat, true, plumb and square edges, at edges to remain. Use carborundum or diamond saw equipment for cutting masonry, concrete, and stone work where edges or surfaces are to remain.
3. Do not cut or remove construction where doing so might weaken or impair the structural integrity or strength of the structural framing or support systems which are to remain.
4. Demolish and remove materials as shown on the drawings without damage to the remaining parts of the structure or mechanical/electrical/utility systems.
5. Remove materials so as not to impose excessive loads on supporting walls, floors or framing and so as not to damage remaining undemolished portions of the structure.
6. Where portions of structures are to be removed, remaining portions shall be protected from damage and prepared to fit new construction. Damage to portions of structures to remain shall be repaired.
7. Reinforcing steel in existing structures shall be left in place, cleaned, and aligned to provide tie with new work.
8. Existing waterproofing systems and flashings shall be carefully exposed and protected to maintain workable conditions of fitting new work with existing construction.
9. Proceed with demolition in a systematic manner.
10. Demolish concrete and masonry in small sections.
11. Remove structural framing members and lower to the ground by means of hoists, derricks, or other suitable methods.

**B. Shoring**

1. Design, provide, erect, and maintain necessary temporary shoring, bracing, framing, or support where load bearing structural or supporting members are removed or weakened by cuts or openings or are subject to damage from demolition operations, and otherwise as required for safety or to protect finish surfaces from damage.
2. Construction and adequacy of the shoring shall be the entire responsibility of the Contractor. Any damage caused by the inadequacy of the shoring or other support shall be the responsibility of the Contractor to remedy at no additional expense to the City of New York.
3. Shoring and bracing shall remain until new structural framing and/or supports are installed. Coordinate operations fully with other trades.



4. Be ready at any time to promptly provide, add to, or strengthen temporary shoring, bracing, or support for existing work, in case existing construction begins to show signs of structural stress.

**3.5 WORKMANSHIP STANDARDS FOR ALTERATION AND REMOVAL WORK**

- A. Cut, remove, alter, temporarily remove and replace, or relocate existing work as required for performance of the work. Perform such work required with due care, including shoring and bracing.
- B. Coordinate patching involving the various trades whether or not specifically mentioned in the respective specification Sections.
- C. Materials or items demolished and not designated to become the property of the City of New York, or to be reinstalled, shall become the property of the Contractor, and shall be removed from the City of New York's property.
- D. Execute the work in a careful and orderly manner, with the least possible disturbance to the public and to the occupants of adjacent buildings.
- E. In general, demolish masonry in small sections. Where necessary to prevent collapse of any construction, install temporary shores, struts, or bracing.
- F. Materials to be removed by existing elevators shall be put in enclosed containers.
- G. Where existing equipment and/or fixtures are indicated to be reused, repair such equipment and/or fixtures and refinish to put in perfect working order. Refinish as directed.
- H. Cut out embedded anchorage and attachment items as required to properly provide for patching and repair of the respective finishes.
- I. Confine cutting of existing roof areas designated to remain to the limits required for the proper installation of the new work. Cut and fold back existing roofing. Cut and remove insulation and related items. Provide temporary weathertight protection as required until new roofing and flashings are installed. Consult the City of New York to ascertain if existing guarantee bonds are in force, and execute the work so as not to invalidate such bonds.
- J. Where utilities are removed, relocated, or abandoned, cap, valve, plug, or bypass to make complete and working installation.
- K. Restore existing pipe and duct coverings damaged by work under this Contract to original undamaged condition.
- L. Immediately restore to service and repair any damage caused by Contractor's workmen to existing pipe and conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems which are not scheduled for discontinuance or abandonment.

## **HARPER STREET YARD**

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- M. Upon completion of contract, deliver work complete. Damage that may be caused by Contractor or Contractor's workmen to existing structures designated to remain, grounds, and utilities shall be repaired by Contractor and left in as good condition as existed prior to damaging.
- N. Restore finish work of floors, walls, and ceilings remaining in place but damaged or defaced because of demolition or alteration work to condition equal that which existed at beginning of work under this Contract.
- O. Where alteration or removals expose damaged or unfinished surfaces or materials, refinish such surfaces or materials, or remove them and provide new or salvaged materials to make continuous surfaces uniform.
- P. Perform new work and restore and refinish existing work in conformance with applicable requirements of the specifications, except as follows:
  - 1. Materials for use in repair of existing surfaces, but not otherwise specified, shall conform to the highest standards of the trade involved, and be in accordance with approved industry standards, and shall be as required to match existing surfaces.
  - 2. Workmanship for repair of existing materials shall, unless otherwise specified, be equal to similar workmanship existing in or adjacent to the space where the work is being done.
  - 3. Installation of salvaged items where no similar items exist shall be done in accordance with the highest standards of the trade involved and in accordance with approved shop drawings.
- Q. Materials or items designated to become the property of the City of New York shall be as shown on the drawings. Remove such items with care and store them in a location at the site to be designated by the City of New York.
- R. Materials or items designated to be reinstalled shall be as shown on the drawings. Remove such items with care under the supervision of the trade responsible for reinstallation; protect and store until required. Replace materials or items damaged in their removal with similar new material.
- S. The existing building shall not be used as a work shop. Neither shall the furnishings or equipment in any room be used as work benches. Should any damage occur during the progress of the work to any furniture, fixtures, equipment, or appurtenances therein, such damage shall be repaired, replaced or made good by the Contractor without extra cost to the City of New York.
- T. Where removing existing floor finish and base, remove all adhesive and leave floors and walls smooth and flush, ready to receive new finish.
- U. Finish new and adjacent existing surfaces as specified for new work. Clean existing surfaces of dirt, grease and loose paint before refinishing.

**3.6 DISPOSAL OF DEMOLISHED MATERIALS**

**A. General**

1. Remove from the site debris, rubbish, and other materials resulting from work of this Section.
2. Burning of removed materials from demolished structures will not be permitted on the site.

- B. Removal:** Transport materials removed from demolished structures and legally dispose of off site. Pay any and all fees associated with disposal work. Leave the site in an orderly condition to the approval of the Commissioner.

**3.7 CLEANING UP**

- A.** Remove debris as the work progresses. Maintain existing premises in a neat and clean condition.

**END OF SECTION**

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**SECTION 026500**

**REMOVAL OF UNDERGROUND STORAGE TANKS**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

The Contractor shall furnish all labor, materials, tools and equipment and remove or permanently close all underground storage tanks as required by the Contract Documents.

**1.02 SUBMITTALS**

The following items shall be submitted to the Construction Manager for review and approval.

- A. Detailed Work Plan: This plan shall be submitted within 15 days after the date of Notice to Proceed and describe methods, equipment, and sequences of operations including, but not limited to:
  - 1. Tank contents removal
  - 2. Spill Prevention
  - 3. Exploratory excavations
  - 4. Tank purging procedure
  - 5. Interior and exterior tank cleaning procedure
  - 6. Wastewater Collection and Disposal
  - 7. Facility to perform analyses
  - 8. Removal or permanent closure of underground storage tank
  - 9. Transportation and disposal of underground storage tank
  - 10. Anticipated use, recycling or disposal of tank contents
  - 11. Soil/Groundwater sampling procedure
- B. A detailed Chemical Data Acquisition Plan (CDAP).
- C. Documentation of the assessment performed, including analytical testing results.
- D. Copies of manifests required to transport waste materials. These manifests shall be submitted within 24 hours following their preparation.

- E. Documentation of acceptance of waste materials by a facility permitted to treat or dispose of those type of materials. These documentations shall be submitted no later than 7 days following delivery of waste materials to the permitted facility.
- F. Letters of acceptance from the permitted facility and haulers acknowledging agreement to accept the waste material. These letters shall be submitted not more than 14 days before transporting any waste materials.
- G. For each underground storage tank site a Tank Closure Report shall be prepared in a standard 3-ring binder and submitted within 14 days of completing work at each site. Tank Closure Reports, at a minimum shall include the following information:
  - 1. A cover letter signed by the Contractor certifying that all work is performed in accordance with the terms and conditions of the Contract Documents.
  - 2. A narrative report which at a minimum describes the following:
    - a. Condition of the tank and appurtenances
    - b. Any visible evidence of leaks or stained soils
    - c. Results of vapor monitoring readings
    - d. Actions taken including quantities of materials treated or removed
    - e. Reasons for selecting sample locations
    - f. Sample locations
    - g. Sample collection data such as time of collection and method of preservation
    - h. Whether or not groundwater was encountered; if it was, depth to groundwater table
    - i. Documentation of final disposal or use of the removed underground tank
  - 3. Copies of all analyses performed for disposal
  - 4. Copies of all waste analyses or waste profile sheets
  - 5. Copies of all certifications of final disposal signed by the responsible disposal facility official
  - 6. Information on who sampled, analyzed, transported, and accepted all wastes encountered and copies of manifests
  - 7. Copies of all analyses performed for verification that underlying soil is not contaminated, with copies of chain-of-custody for each sample. All analyses shall give the identification number of the sample analyzed. Sample identification numbers shall correspond to those provided on the one-line drawings.
  - 8. Scaled, one-line drawings showing tank locations, limits of excavation, limits of contamination, underground utilities within 50 feet, sample locations, and sample identification numbers.

9. Progress Photographs. The Contractor shall take minimum of 4 views of the site showing such things as the location of each tank, entrance/exit road, and any other notable site condition before work begins.

After work has been started at the site, the Contractor shall photographically record activities at each work location daily. Photographs shall be 3" by 5" and shall include, at a minimum, the following:

- a. Soil removal, handling, and sampling
- b. Unanticipated events such as discovery of additional contaminated areas
- c. Soil stockpile area
- d. Tank
- e. Site- or task-specific employee respiratory and personal protection
- f. Fill placement and grading
- g. Post-construction photographs. After completion of work at each site, the Contractor shall take a minimum of 4 views of the site.
- h. Prints shall illustrate the condition and location of work and the state of progress. The photographs shall be mounted and enclosed back-to-back in a double face plastic sleeve punched to fit standard 3-ring binders. Each color print shall show an information box, 1-1/2" by 3-1/2". The information box for the 3" x 5" photographs shall be scaled down accordingly, or taped to the bottom of the photo. The box shall be typewritten and arranged as follows:

Project No.	Contract No.
Location	
Contractor/Photographer	
Photograph No.	Date/Time:
Description	
Direction of View	

#### 1.03 PERMIT AND LICENSE REQUIREMENTS

- A. Prior to the commencement of work under this Contract, all permits and licenses required to perform the work shall be obtained by the Contractor. Determining license and permit requirements shall be the responsibility of the Contractor.
- B. The permit and notification requirements for underground storage tank removal or closure shall include, but not be limited to, the following:

1. New York State Department of Environmental Conservation (NYSDEC)

- a. Storage tanks must be registered with the NYSDEC. If a tank is being closed or its use is being changed, and it is not currently registered, the tank must be registered by the Contractor before proceeding with his removal or closure activities. Thirty (30) days prior to initiation of closure activities, the Contractor shall notify the NYSDEC (Region 2) of the intent to remove or close a storage tank.
- b. The Contractor shall comply with the requirements of 6 NYCRR Part 612, 6 NYCRR Part 613, 6 NYCRR Part 614, NYSDEC Memo #1, and NYSDEC SPOTS No. 14.

2. New York City Fire Department

The Contractor shall prepare an affidavit of permanent closure for each facility within 7 days of tank closure. The affidavit shall state the Contractor's method of tank closure. The affidavit shall be prepared in a format acceptable to the New York City Fire Department and signed by the Contractor's licensed underground storage tank system installer. The affidavit shall be submitted to the New York City Fire Department, Buried Tank Unit – Room 412, 250 Livingston Street, Brooklyn, New York.

1.04 APPLICABLE STANDARDS

The publications are referenced by basic designation only and shall be the latest published version.

- American Petroleum Institute (API)

API Publ 1628	A Guide to the Assessment and Remediation of Underground Petroleum Releases
API Publ 2015	Safe Entry and Cleaning of Petroleum Storage Tanks, Planning and Managing Tank Entry From Decommissioning through Recommissioning.
API Publ 2217	Guidelines for Confined Space Work in the Petroleum Industry
API Publ 2219	Safe Operating Guidelines of Vacuum Trucks in Petroleum Service
API Publ 1604	Closure of Underground Petroleum Storage Tanks
API Publ 2003	Protection Against Ignitions Arising out of Static, Lightning and Stray Currents



- American Society for Testing and Materials (ASTM)
  - ASTM C94                      Specification for Ready-Mixed Concrete
- Code of Federal Regulations (CFR)
  - CFR 40 Part 260 Hazardous Waste Management System: General
  - CFR 40 Part 261 Identification and Listing of Hazardous Waste
  - CFR 40 Part 262 Standards Applicable to Generators of Hazardous Waste
  - CFR 40 Part 263 Standards Applicable to Transporters of Hazardous Waste
  - CFR 40 Part 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
  - CFR 40 Part 265 Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
  - CFR 40 Part 266 Standards for the Management of Specific Hazardous Waste and Specific Types of Hazardous Waste Management Facilities
  - CFR 40 Part 268 Land Disposal Restrictions
  - CFR 40 Part 280 Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks
- Environmental Protection Agency (EPA)
  - EPA SW-846      Test Methods for Evaluating Solid Waste, Physical/Chemical Methods
  - EPA 8021          1987 Volatile Organic Compounds in Water by Purge and Trap  
Capillary Column Gas Chromatography with PID and  
Electroconductivity Detector in Series
  - EPA 8270          Semivolatile Organic Compounds in Water by Gas  
Chromatography/Mass Spectrometry Using a Capillary Column
- New York City Fire Department
  - FP Directive 3-73 Division of Fire Protection
- New York State Department of Environmental Conservation (NYSDEC)
  - 6 NYCRR Part 612      Registration of Petroleum Storage Facilities
  - 6 NYCRR Part 613      Handling and Storage of Petroleum

6 NYCRR Part 614	Standards for New and Substantially Modified Petroleum Storage Facilities
NYSDEC Memo #1	NYSDEC Spill Technology and Remediation Series (STARS) Memo #1: Petroleum-Contaminated Soil Guidance Policy
NYSDEC SPOTS No. 14	NYSDEC Spill Prevention Operations Technology Series (SPOTS) Document No. 14: Site Assessments at Bulk Storage Facilities
6 NYCRR Part 372	Hazardous Waste Manifest System and Related Standards for Generators, Transporters, and Facilities

1.05 TANK DESCRIPTIONS

- A. Locations: General locations of all tanks and limited piping and appurtenances are shown on the Contract Drawings. Specific locations of tanks, piping, and appurtenances shall be defined by exploratory excavations performed by the Contractor.
- B. Tank Contents: Tanks have been used for storage of petroleum products.

PART 2 - PRODUCT

(Not Used)

PART 3 - EXECUTION

3.01 REMOVAL OR PERMANENT CLOSURE OF UNDERGROUND STORAGE TANKS

The procedures for removing or closing the tanks shall include, but not be limited to, the following:

- A. All product that can be pumped out shall be removed.
- B. Products shall be drained and flushed from the piping into the tanks.
- C. Remaining liquid shall be removed from the tanks.
- D. Access shall be provided to the interior of the tanks through existing manholes. If the tanks do not have manholes, the Contractor shall excavate in accordance with SECTION: EXCAVATION and provide access to the tank upon completion of purging activities.
- E. All piping and gauge lines, with the exception of the vent lines, shall be disconnected and capped.
- F. The tank storage systems, including all tanks and piping, shall be purged of flammable vapors.

- G. The interior of the tanks shall be cleaned with a high pressure rinse.
- H. As shown on the Contract Drawings, tanks shall be removed and disposed of or, when abandoned in-place, completely filled with Class A concrete, sand or flowable fill corresponding to the NYSDOT Standard Specifications.
- I. For method of cutting tanks, see API RP 2015.
- J. The vent lines shall be capped at the tanks, cut flush at the roof and capped or removed and disposed of.
- K. All openings to the tanks including, but not limited to, fill boxes, manholes and gauge boxes shall be filled with concrete flush with the finish with the finished floor.

**3.02 SITE ASSESSMENT**

- A. General: The Contractor shall perform a site assessment to determine if there is any contamination present at the site. The site assessment shall be conducted in accordance with NYSDEC SPOTS No. 14.
- B. Equipment: The Contractor shall select the means and methods for performing drilling/sampling operations. The Contractor is solely responsible for determining the adequacy of his equipment to perform the intended work. If the Contractor's equipment is not adequate to perform the work, the Contractor shall replace it with suitable equipment at no additional cost to the City.
- C. Sampling Procedure-Tanks Closed In-Place: In general, the Contractor shall conduct a minimum of four (4) borings around each tank that is to be abandoned in-place. Additional borings shall be placed along pipe runs at 20 foot intervals and at dispensers and fill boxes. The Contractor shall conduct continuous split spoon sampling in accordance with API Publ. 1628, starting at a depth of 5 feet below grade to a depth of 15 feet below grade. Additional samples shall be collected at 10-foot intervals starting at a depth of 25 feet below grade and continuing until groundwater or bedrock is encountered. The Contractor shall provide all required monitoring instruments and screen all samples collected for vapor contamination using a Photoionization Detector (PID) or other approved instrument. The sample showing the highest vapor contamination shall be sent to the lab for analysis. If the PID does not indicate that any of the samples are contaminated, then the final sample from the soil/water or soil/bedrock interface shall be sent to the lab for analysis. If groundwater is encountered then a minimum of 1 groundwater sample from each boring location shall be collected and sent to the lab for analysis.
- D. Sampling Procedure-Tanks Removed: In general, the Contractor shall collect a minimum of five (5) soil samples in accordance with API Publ 1628 from any area around the removed tank that appears to be visually contaminated. Soil samples from the material surrounding piping will be taken at 20-foot intervals and at dispensers and fill boxes. If there are no visible areas of contaminated soil, then the Contractor shall collect 1 sample from each sidewall of the excavation, 2 samples from the bottom of the excavation and 2 samples from a depth of 2 to 3 feet below the bottom of the excavation. If groundwater is

within 5 feet of the bottom of the excavation, then a groundwater sample shall be taken. The Contractor shall screen all samples collected for vapor contamination using a PID or other approved instrument.

- E. Lab Analysis: Samples collected for analysis shall be sent to the Contractor's independent testing lab. For tanks containing gasoline, samples shall be analyzed using EPA Test Method SW8260B plus methyl tert butyl ether (MTBE). For tanks containing diesel fuel, samples shall be analyzed for volatile organics analyzed using EPA Test Method SW8260B and semi-volatiles using EPA Method SW8270C. The Contractor shall submit the lab analysis results to the Construction Manager within 7 days of the sampling.

### **3.03 TANK CONTENTS REMOVAL AND DISPOSAL**

Tank contents shall be removed, contained, and disposed of in accordance with applicable regulations.

Tank contents may include, but is not limited to, the following:

- A. Salvageable Petroleum Product
- B. Contaminated Water
- C. Sludge Materials

### **3.04 DISPOSAL OF REMOVED MATERIALS**

All excavated and removed materials shall be disposed of in accordance with applicable regulations.

### **3.05 PROTECTION OF EXISTING STRUCTURES AND UTILITIES**

Protection of existing structures and utilities shall be performed.

### **3.06 SPILL PREVENTION**

Spill prevention measures shall be implemented in the Contract Documents.

**END OF SECTION**

**SECTION 230013 – GENERAL CONTRACTOR WORK**  
**ALLOWANCE FOR INCIDENTAL ASBESTOS ABATEMENT**

**1.01 SCOPE FOR ASBESTOS ABATEMENT WORK**

- A. The "General Conditions" apply to the work of this Section.
- B. The Asbestos abatement contractor shall remove asbestos containing materials as needed to perform the other work of this Contract when discovered during the course of work. When required, the Asbestos abatement contractor shall replace the ACM with non-asbestos containing materials. An allowance of **\$15,000.00** for the **General Contractor** is herein established for this incidental work when so ordered and authorized by the Commissioner.
- C. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE APPLICABLE PROVISIONS OF THE RULES AND REGULATIONS OF THE ASBESTOS CONTROL PROGRAM AS PROMULGATED BY TITLE 15 CHAPTER 1 OF RCNY AND NEW YORK STATE DEPARTMENT OF LABOR INDUSTRIAL CODE RULE 56 CITED AS 12 NYCRR, PART 56 WHICHEVER IS MORE STRINGENT AS PER LATEST AMENDMENTS TO THESE LAWS AND AS MODIFIED HEREIN BY THESE SPECIFICATIONS.
- D. ALL DISPOSAL OF ASBESTOS CONTAMINATED MATERIAL SHALL BE PER LOCAL LAW 70/85.
- E. THE ASBESTOS ABATEMENT CONTRACTOR'S ATTENTION IS DIRECTED TO THE FACT THAT CERTAIN METHODS OF ASBESTOS ABATEMENT ARE PROTECTED BY PATENTS. TO DATE, PATENTS HAVE BEEN ISSUED WITH RESPECT TO "NEGATIVE PRESSURE ENCLOSURE" OR "NEGATIVE-AIR" OR "REDUCED PRESSURE" AND "GLOVE BAG".
- F. THE ASBESTOS ABATEMENT CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR AND SHALL HOLD THE DEPARTMENT OF DESIGN AND CONSTRUCTION AND THE CITY HARMLESS FROM ANY AND ALL DAMAGES, LOSSES AND EXPENSES RESULTING FROM ANY INFRINGEMENT BY THE ASBESTOS ABATEMENT CONTRACTOR OF ANY PATENT, INCLUDING BUT NOT LIMITED TO THE PATENTS DESCRIBED ABOVE, USED BY THE ASBESTOS ABATEMENT CONTRACTOR DURING PERFORMANCE OF THIS AGREEMENT.
- G. "Asbestos" shall mean any hydrated mineral silicate separable into commercially usable fibers, including but not limited to chrysotile (serpentine), amosite (cummingtonite-grunerite), crocidolite (riebeckite), tremolite, anthrophyllite and actinolite.

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- H. Prior to starting, the Asbestos abatement contractor must notify the Commissioner of the Department of Design and Construction if he/she anticipates any difficulty in performing the Work as required by these Specifications. The Asbestos abatement contractor is responsible to prepare and submit all filings, notifications, etc. required by all City, State and Federal regulatory agencies having jurisdiction.

The Asbestos abatement contractor is responsible for submitting the Asbestos Project Notification Form (ACP-7 Form) to the Department of Environmental Protection, Asbestos Control Program, as per Title 15, Chapter I of RCNY and to the NYSDOL as per Industrial Code Rule 56.

The Asbestos abatement contractor is responsible for preparing, and submitting Asbestos Variance Application (ACP-9). If a Variance is required, the Asbestos abatement contractor is responsible to retain a NYSDOL Asbestos Project Designer, as defined in Title 15, Chapter 1 of the RCNY to prepare and submit the required variance.

The Asbestos abatement contractor is responsible for preparing and submitting an Asbestos Abatement Permit and/or Work Place Safety Plans (WPSP) that may be required for the completion of the Contract or incidental work. If such plans are required, the Asbestos abatement contractor is responsible to retain a NYSDOL Licensed Design Professional as defined in Title 15, Chapter 1 of the RCNY to prepare and submit the required plans.

The Asbestos abatement contractor is responsible for the submission of all required documents to the NYCDEP to acquire the appropriate Asbestos Project Conditional Closeout (ACP-20) and/or Asbestos Project Completion Forms (ACP-21) on a timely basis for the completion of the incidental work encountered under this contract.

The Asbestos abatement contractor will be required to attend an on-site job meeting with the Construction Project Manager prior to the start of work to examine conditions and plan the sequence of operations, etc.

The Asbestos abatement contractor shall have a NYSDOL/NYCDEP Asbestos Supervisor onsite to oversee the work and conduct a final visual inspection as required by both Title 15, Chapter 1 of the RCNY and NYSDOL Industrial Code Rule 56.

- I. All work shall be done during regular working hours unless the Asbestos abatement contractor requests authorization to work in other than regular working hours and such authorization is granted by the Commissioner. (Regular work hours are those hours during which any given facility, in which work is to be done, is customarily open and functioning, normally between the hours of 8:00 A.M. and 4:00 P.M. Monday - Friday.) If such work schedule is authorized by the Commissioner, the work shall be done at no additional cost to the City.

- J. The Commissioner may order that work be done in other than regular working hours as herein by defined and this order may require the Asbestos abatement contractor to pay premium or overtime wages to complete the work. If the Commissioner orders work in other than regular working hours, the Asbestos abatement contractor shall multiply the unit price for that portion of the work requiring premium wages by 1.50 when computing payment in accordance with Paragraph 1.09. All requests for premium payment must be supported by certified payroll sheets and field sheets approved by the Construction Project Manager.

## **1.02 QUALIFICATIONS OF ASBESTOS ABATEMENT CONTRACTOR**

- A. Requirements: The asbestos abatement contractor must demonstrate compliance with the special experience requirements set forth in subparagraphs (1) through (5) below. The asbestos abatement contractor must, submit documentation demonstrating compliance with all listed requirements. Such documentation shall include without limitation, all required licenses, certificates, and documentation.
1. The asbestos abatement contractor must, whether an individual, corporation, partnership, joint venture or other legal entity, must demonstrate for the three year period prior to the work, that it has been licensed by the New York State Department of Labor, as an "Asbestos abatement contractor".
  2. The asbestos abatement contractor must, for the three year period prior to the work, have been in the business of providing asbestos abatement services as a routine part of its daily operations.
  3. The asbestos abatement contractor proposing to do asbestos abatement work must be thoroughly experienced in such work and must provide evidence of having successfully performed and completed in a timely fashion at least five (5) asbestos abatement projects of similar size and complexity. The aggregate cost of these projects must be at least \$250,000.00 in each of the three years.
  4. For each project submitted to meet the experience requirements set forth above, the asbestos abatement contractor must submit the following information for the project; name and location of the project; name title and telephone number of the owner or the owner's representative who is familiar with the asbestos abatement contractor's work, brief description of the work completed as a prime or sub-asbestos abatement contractor; amount of contract or subcontract and the date of completion.
  5. The asbestos abatement contractor must demonstrate that it has the financial resources, supervisory personnel and equipment necessary to carry out the work and to comply with the required performance schedule, taking into consideration other business commitments. The asbestos

## GENERAL CONTRACTOR WORK ALLOWANCE FOR INCIDENTAL ASBESTOS ABATEMENT

abatement contractor must submit such documentation as may be required by the Department of Design and Construction to demonstrate that it has the requisite capacity to perform the required services of this contract.

- B. Insurance Requirements: The asbestos abatement contractor must provide asbestos liability insurance in the following amount: 1 million dollars per occurrence, 2 million dollars aggregate (combined single limit). The City of New York shall be named as an additional insured on such insurance policy.
- C. Throughout the specifications, reference is made to codes and standards which establish qualities and types of workmanship and materials, and which establish methods for testing and reporting on the pertinent characteristics thereof.

### **1.03 ASBESTOS ABATEMENT CONTRACTOR RESPONSIBILITIES**

The Asbestos abatement contractor will visit the subject location within one (1) working day of notification to ascertain actual work required. If the project is identified as being "urgent", then work shall commence no later than 48 hours from the time of notification. In this event, the asbestos abatement contractor shall immediately notify when applicable EPA NESHAPS Coordinator, NYSDOL Asbestos Control Bureau and NYCDEP Asbestos Control Program of start of the work and file the necessary Asbestos Notifications and any applicable Variance Applications with the regulatory agencies cited above..

In the event that the project is not classified as "urgent" the Asbestos abatement contractor shall notify the EPA NESHAPS Coordinator, NYSDOL and NYCDEP by submitting the requisite asbestos project notification forms, postmarked 10 days before activity begins if 260 linear feet or more and/or 160 square feet or more of asbestos containing material will be disturbed.

The following information must be included in the notification:

- A. Name and address of building City or operator;
- B. Project description:
  - 1. Size - square feet, number of linear feet, etc;
  - 2. Age - date of construction and renovations (if known);
  - 3. Use - i.e., office, school, industrial, etc.
  - 4. Scope - repair, demolition, cleaning, etc.
- C. Amount of asbestos involved in work and an explanation of techniques used to determine the amount;



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- D. Building location/address, including Block and Lot numbers;
- E. Work schedule including the starting and completion dates;
- F. Abatement methods to be employed;
- G. Procedures for removal of asbestos-containing material;
- H. Name, title and authority of governmental representative sponsoring project.

**1.04 WORK INCLUDED IN UNIT PRICE**

The Asbestos abatement contractor will be paid a basic unit price of **\$25.00** per square feet for the removal and disposal of asbestos containing material and replacement of the same with non-asbestos containing materials.

Unit price shall include all costs necessary to do the work of this Contract, including but not limited to: labor, materials, equipment, utilities, disposal, insurance, overhead and profit.

**1.05 AIR MONITORING – ASBESTOS ABATEMENT CONTRACTOR**

- A. “Air Sampling” shall mean the process of measuring the fiber content of a known volume of air collected during a specific period of time. The procedure utilized for asbestos follows the NIOSH Standard Analytical Method 7400 or the provisional transmission electron microscopy methods developed by the USEPA and/or National Institute of Standard and Technology which are utilized for lower detectability and specific fiber identification.
- B. Air monitoring of Asbestos abatement contractor’s personnel will be performed in conformance with OSHA requirements, (All costs associated with this work are deemed included in the unit price.).
- C. Qualifications of Testing Laboratory:

The industrial hygiene laboratory shall be a current proficient participant in the American Industrial Hygiene Association (AIHA) PAT Program. The laboratory identification number shall be submitted and approved by the City. The laboratory shall be accredited by the AIHA and New York State Department of Health Environmental Laboratory Approval Program (ELAP).

Note: Work area air testing and analysis before, during and upon completion of work (clearance testing) will be performed by a Third Party Air Monitor under separate Contract with the City.

**1.06 THIRD PARTY MONITORING AND LABORATORY**

- A. The NYCDDC, at its own expense, will employ the services of an independent Third Party Air Monitoring Firm and Laboratory. The Third Party Air Monitor will perform air sampling activities and project monitoring at the Work Site.
- B. The Laboratory will perform analysis of air samples utilizing Phase Contrast Microscopy (PCM) and/or Transmission Electron Microscopy (TEM).
- C. The Third Party Air Monitoring Firm and the designated Project Monitor shall have access to all areas of the asbestos removal project at all times and shall continuously inspect and monitor the performance of the Asbestos abatement contractor to verify that said performance complies with this Specification. The Third-Party Air Monitor shall be on site throughout the entire abatement operation.
- D. The NYCDDC will be responsible for costs incurred with the Third Party Air Monitoring Firm and laboratory work. Any subsequent additional testing required due to limits exceeded during initial testing shall be paid for by the Asbestos abatement contractor.

**1.07 PAYMENT REQUEST DOCUMENTATION**

- B. The following information shall be included for each payment request:
  - 1. Description of work performed.
  - 2. Linear footage and pipe sizes involved.
  - 3. Square footage for boiler & breaching insulation removed.
  - 4. Square footage of non pipe and boiler areas removed, patched, enclosed, sealed, or painted.
  - 5. Square footage of encapsulation, sealing, patching, and painting involved.
  - 6. Total cost associated with compliance with the assigned task.
  - 7. Architectural, Electrical, HVAC, Plumbing, etc. work incidental to the Asbestos Abatement Work.
  - 8. A certified copy (in form 4312-39) to the Comptroller or Financial Officer of the New York City to the effect that the financial statement is true.
  - 9. A signed copy (in form 6506q-6) of certificate of compliance with non-discriminatory provisions of the Contract.

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10. Attach a copy of valid workmen compensation insurance.
  11. Valid asbestos insurance per occurrence.
  12. General liability insurance when required.
- C. Each payment request shall include a grand total for all work completed that billing period, the landfill waste manifests and a copy of waste transporter permit. The Department of Design and Construction will inspect the work performed, review the cost and approve or disapprove requests for payment.
- D. EXPOSURE LOG: With this final payment, the Asbestos abatement contractor shall submit a listing of the names and social security numbers of all employees actively engaged in the abatement work of this Contract. This list shall include a summary showing each part of the abatement work in which the employee was engaged and the dates thereof.

### 1.08 QUANTITY CALCULATIONS

In order to determine the square footage involved for the various pipe sizes of pipe insulation that might be encountered, the following table is to be used.

PIPE INSULATION SIZE O.D.	PIPE SIZE O.D.	SQUARE FOOTAGE PER LINEAR FOOT
2-1/2"	1/2"	0.65
2-3/4"	3/4"	0.72
3"	1"	0.79
3-1/4"	1-1/4"	0.85
3-1/2"	1-1/2"	0.92
4"	2"	1.05
4-1/2"	2-1/2"	1.18
5"	3"	1.31
6"	3-1/4"	1.57
7"	3-1/2"	1.83
8"	4"	2.09
9"	5"	2.36
10"	6"	2.62
12"	8"	3.14
14"	10"	3.67
16"	12"	4.19
18"	14"	4.71

### 1.09 METHOD OF PAYMENT

Payment shall be made in accordance with Items A through R below. Payment shall be calculated based on the actual quantity of the item performed by the asbestos abatement

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contractor, times the unit price specified below. Credits may apply to certain times, as specified below.

- A. **REMOVAL, DISPOSAL AND REPLACEMENT OF ASBESTOS CONTAINING PIPE INSULATION:** Actual linear footage, multiplied by the square footage factor listed for the respective pipe size in Section 1.09, multiplied by the unit price in Section 1.05.

EXAMPLE: 100 lin.ft. of 1/2" pipe and 100 lin.ft. of 6" pipe, including elbows, tees. Flanges, etc.

100 X 0.65 = 65 sq.ft.      65 x unit price = Payment

100 X 2.62 = 262 sq.ft.      262 x unit price = Payment

- B. **REMOVAL, DISPOSAL AND REPLACEMENT OF BOILER INSULATION:** (all types including Silicate Block and including the removal/replacement of metal jacketing) Payment shall be made at 1.5 times the unit price per square foot.

EXAMPLE: Item B. removal and replacement of 1000 S.F. of boiler insulation (incl. Silicate block)

1000 S.F. X (1.5) X the Unit Price = Payment

- C. **REMOVAL, DISPOSAL AND REPLACEMENT OF TANK INSULATION:** (all types including removal/replacement of metal jacketing) Payment shall be made at 1.5 times the unit price per square foot.

- D. **REMOVAL, DISPOSAL AND REPLACEMENT OF BOILER UPTAKE, & BREACHING INSULATION:** (all types including stiffening angles and wire lath) Payment shall be made at 2.0 times the unit price per square foot.

- E. **REMOVAL, DISPOSAL AND REPLACEMENT OF DUCT INSULATION:** Payment shall be made at 1.0 times the unit price per square foot.

- F. **REMOVAL, DISPOSAL AND REPLACEMENT OF SOFT ASBESTOS CONTAINING MATERIAL:** (Including sprayed-on fire proofing and sound proofing) Payment shall be made at 1.0 times the unit price per square foot of surface area. Area of irregular surfaces must be calculated and confirmed with DDC representative.

- G. **ACOUSTIC PLASTER REPAIR AND/OR ENCAPSULATION:** Payment shall be made at 0.5 times the unit price per square foot.

- H. **PATCHING OR REPAIR** of items listed in A through F will be paid at 0.33 times the unit price per square foot.

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- I. **REMOVAL, DISPOSAL AND REPLACEMENT OF WATERPROOFING ASBESTOS CONTAINING MATERIAL:** (including friable and non-friable waterproofing material from interior and exterior walls, floors, foundations, penetrations, louvers, vents and openings other than windows, doors and skylights) Payment shall be made at 0.5 times the unit price per square foot.
- J. **REMOVAL, DISPOSAL AND REPLACEMENT OF ASBESTOS CONTAINING ELECTRICAL WIRING INSULATION:** (including friable and non-friable wiring insulation) Payment shall be made at 0.33 times the unit price per square foot.
- K. **PAINTING:** Payment shall be made at 0.05 times the unit price per square foot.
- L. **REMOVAL AND DISPOSAL OF ASBESTOS-CONTAINING PLASTER:** from ceilings and walls, including any wire lath and disposal as asbestos containing waste. Payment shall be made at 0.80 times the unit price per square foot.
- M. **REMOVAL AND DISPOSAL OF ASBESTOS-CONTAINING FLOOR TILES, CEILING TILES, TRANSITE PANELS:** (including any adhesive, glue, mastic and/or underlayment) and disposal as asbestos containing waste. Payment shall be made at 0.40 times the unit price per square foot. If multiple layers are discovered, each additional layer shall be paid at 0.20 times the unit price per square foot.
- N. **ADDITIONAL CLEAN UP/HOUSEKEEPING OF WORK AREA:** (excluding pre-cleaning of work area required by regulations) HEPA vacuuming and wet cleaning of asbestos contaminated surface. Payment shall be made at 0.20 times the unit price per square foot. When GLOVE BAG is employed to remove ACM, cost of HEPA vacuuming and wet cleaning of floor area up to 3 feet on each side of glove-bag shall be included in unit price and no extra payment will be made.
- O. **REMOVAL, DISPOSAL OF ASBESTOS-CONTAINING ROOFING MATERIAL:** including mastic, flashing and sealant compound and provide temporary asbestos-free roof covering consisting of one layer of rolled roofing paper sealed with asphaltic roofing compound. Payment shall be made at 0.8 times the unit price per square foot. Credit at a rate of 0.33 times the unit price will be taken for each square foot of temporary roof covering which the Asbestos abatement contractor is directed not to install.
- P. **PICK-UP AND DISPOSAL OF GROSS DEBRIS:** (excluding any waste generated from abatement under Item A-R) at a rate of \$150 per cubic yard for asbestos contaminated waste and \$75 per cubic yard for non-asbestos contaminated waste. This cost includes all labor and material cost associated with work.

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- Q. REMOVAL OF ASBESTOS-CONTAINING BRICK, BLOCK, MORTAR, CEMENT OR CONCRETE:** along with all surfacing materials including wire lath and/or other supporting structures and disposal as ACM waste. Payment shall be made at a rate of \$25.00 per cubic foot of material removed.
- R. REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING WINDOW/DOOR CAULKING:** including friable and non-friable caulking, weather-stripping, glazing, sealants or other waterproofing materials applied to windows, doors, skylights, etc. Payment shall be made at the rate of \$400.00 per opening regardless of size or configuration. This cost includes labor, consumable materials, set-up/breakdown, removal and disposal, as required.

**Note 1: CREDIT:** For items listed in A through F, a credit at a rate of 0.33 times the unit price, times the respective multiplier (for each item) will be taken for each square foot of insulation which the asbestos abatement contractor is not directed to reapply.

**Note 2: MINIMUM PAYMENT:** The minimum payment per call at any individual job sites or various job sites during the same day will be eight hundred dollars (\$800.00).

**Note 3:** All payments shall be made as described in paragraph 1.09 herein.

**Note 4: WORKING HIGHER THAN 12 FEET ABOVE FLOOR LEVEL OR WORK REQUIRING COMPLEX SCAFFOLDING OR CONSTRUCTION WORK PLATFORMS:** Provisions are made in this Contract to compensate the Asbestos abatement contractor for work performed in locations that are difficult to access due to work at elevations that are significantly higher than the normal work level. The unit price for these items will be paid at 1.20 times the unit price described in Paragraphs 1.09, A through R for those portions of the work that are more than twelve (12) feet above the grade for that would be judged as the normal working level.

**1.10 GUARANTEE**

- A. Work performed in compliance with each task shall be guaranteed for a period of one year from the date the completed work is accepted by the Department of Design and Construction.
- B. The Commissioner of The Department of Design and Construction will notify the Asbestos abatement contractor in writing regarding defects in work under the guarantee.

**1.11 OCCUPANCY OF SITE NOT EXCLUSIVE**

Attention is specifically drawn to the fact that contractors, performing the work of other Contracts, may be brought upon any of the work sites of this Contract. Therefore, the Asbestos abatement contractor shall not have exclusive rights to any site of his work and shall fully cooperate and coordinate his work with the work of other contractors who may

be brought upon any site of the work of this Contract. This paragraph applies to those areas outside the regulated Work Area as defined by Title 15, Chapter I of RCNY.

## 1.12 SUBMITTALS

### A. Pre-Construction Submittals:

1. Attend a pre-construction meeting scheduled by the City of New York Department of Design and Construction. This meeting shall also be attended by a designated representative of the City of New York third party air monitoring firm, facility manager and the Construction Project Manager. At this meeting, the Asbestos abatement contractor shall present three copies of the following items:
  - a. Asbestos abatement contractor's scope of work, work plan and schedule.
  - b. Asbestos project notifications, approved variances and plans to Government Agencies.
  - c. Copies of Permits, clearance and licenses if required.
  - d. Schedules: the Asbestos abatement contractor shall provide to the Construction Project Manager a copy of the following schedules for approval. Once approved, schedules shall be maintained and updated as received. Asbestos abatement contractor shall post a copy of all schedules at the site:
    - (1) A construction schedule stating critical dates of the project including, but not limited to, mobilization, Work Area preparation, demolition, gross removal, fine cleaning, encapsulation, inspections, clearance monitoring, and phase of refinishing and final inspections. The schedule shall be updated biweekly, at a minimum.
    - (2) A schedule of staffing stating number of workers per shift per activity, name and number of supervisor(s) per shift, shifts per day, and total days to be worked.
    - (3) Submit all changes in schedule or staffing to the Construction Project Manager prior to implementation.
  - e. Written description of emergency procedures to be followed in case of injury or fire. This section must include evacuation procedures, source of medical assistance (name and telephone number to nearest

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hospital) and procedures to be used for access by medical personnel (examples: first aid squad and physician). NOTE: Necessary Emergency Procedures Shall Take Priority Over All Other Requirements of These Specifications.

- f. Material Safety Data Sheets (MSDS) for encapsulants, sealants, firestopping foam, cleaners/disinfectants, spray adhesive and any and all potentially hazardous materials that may be employed on the project. No work involving the aforementioned will be allowed to proceed until MSDS are reviewed.
- g. Worker Training and Medical Surveillance: The Asbestos abatement contractor shall submit a list of the persons who will be employed by him /her to perform the removal work. Present evidence that workers have received proper training required by the regulations and the medical examinations required by OSHA 29 CFR 1926.1101.
- h. Logs: Specimen copies of daily progress log, visitor's log, and disposal log.
  - (1) The Asbestos abatement contractor shall provide a permanently bound log book of minimum 8-1/2" x 11" size at the entrance to the Worker and Waste Decontamination enclosure system as hereinafter specified. Log book shall contain on title page the project name, name, address and phone number of the Asbestos abatement contractor; name, address and phone number of Asbestos abatement contractor and City's third party air monitoring firm; emergency numbers including, but not limited to local Fire/Rescue Department. Log book shall contain a list of personnel approved for entry into the Work Area.
  - (2) All entries into the log shall be made in non-washable, permanent ink and such pen shall be strung to or otherwise attached to the log to prevent removal from the log-in area. Under no circumstances shall pencil entries be permitted. Any significant events occurring during the abatement project shall be entered into the log. Upon completion of the job, the Asbestos abatement contractor shall submit the logbook containing a day-to-day record of personnel log entries countersigned by the Construction Project Manager every day.
- i. Worker's Acknowledgments: Submit statements signed by each employee that the employee has received training in the proper handling of ACM, understands the health implications and risks



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involved; and understands the use and limitations of the respiratory equipment to be used.

**B. During Construction Submittals:**

1. Security and safety logs showing names of person entering workspace, date and time of entry and exit, record of any accident, emergency evacuation, and any other safety and/or health incident.
2. Progress logs showing the number of workers, supervisors, hours of work and tasks completed shall be submitted daily to the Construction Project Manager.
3. Floor plans indicating Asbestos abatement contractor's current work progress shall be submitted for review by the Construction Project Manager.
4. All Asbestos abatement contractors' air monitoring and inspection results.

**C. Project Closeout Submittals:**

Upon completion of the project and as a condition of acceptance, the Asbestos abatement contractor shall present two copies of the following items, bound and indexed:

1. Lien Waivers from Asbestos abatement contractor, Sub-Asbestos abatement contractors and Suppliers,
2. Daily OSHA air monitoring results,
3. All Waste Manifests (Asbestos and Construction Debris), seals and disposal logs,
4. Field Sign-In/Sign-Out Logs for every shift,
5. Copies of all Building Department Forms and Permits,
6. A Letter of Compliance stating that all the work on this project was performed in accordance with the Specifications and all applicable Federal, State and Local regulations,
7. All Warranties as stated in the Specifications,
  - a. Fully executed disposal certificates and transportation manifest.
8. Project Record: The Asbestos abatement contractor shall maintain a project record for all small and large asbestos projects. During the project, the

## GENERAL CONTRACTOR WORK ALLOWANCE FOR INCIDENTAL ASBESTOS ABATEMENT

project record shall be kept on site at all times. Upon completion of the project, the project record shall be maintained by the building owner. The project record shall be submitted to DDC as part of the close out documents. The project record shall consist of:

- a. Copies of licenses of all asbestos abatement contractors involved in the project;
- b. Copies of NYCDEP and NYSDOL supervisor and handler certificates for all workers engaged in the project;
- c. Copies of all project notifications and reports filed with NYCDEP, NYSDOL and USEPA for the project, with any amendments or variances;
- d. Copies of all asbestos abatement permits, including associated approved plans and work place safety plan;
- e. A copy of the air sampling log and all air sampling results;
- f. A copy of the abatement asbestos abatement contractor's daily log book;
- g. Copies of all asbestos waste manifests;
- h. A copy of all Project Monitor's Reports (ACP-15).
- i. A copy of each ATR-1 Form completed for the asbestos project (if required).
- j. A copy of each Asbestos Project Conditional Closeout Report (ACP-20) if required.
- k. A copy of the Asbestos Project Completion Form (ACP-21).

### **1.13 PROTECTION OF FURNITURE AND EQUIPMENT**

Cover all furniture and equipment that cannot be removed from Work Areas. Movable furniture and equipment will be removed from Work Areas by the Asbestos abatement contractor prior to start of work. At the conclusion of the work (after final air testing), the Asbestos abatement contractor will remove all plastic covering on walls, floors, furniture, equipment and reinstall furniture and equipment. He shall remove and store all sheaths, curtains and drapes, and reinstall same following final clean up.

#### **1.14 UTILITIES**

A. General:

All temporary facilities shall be subject to the approval of the Commissioner. Prior to starting work at any site, locations and/or sketches (if required) of temporary facilities must be submitted to the Construction Project Manager for the required approval.

B. Water:

The Department of Design and Construction will furnish all water needed for construction, at no cost to the Asbestos abatement contractor in buildings under their jurisdiction. However, it is the responsibility of the Asbestos abatement contractor to ensure that hot water is provided for showering in the decontamination unit. The Asbestos abatement contractor shall furnish, install and maintain any needed equipment to meet these requirements at his own expense.

C. Electricity:

The Department of Design and Construction will furnish all electricity needed for construction, at no cost to the Asbestos abatement contractor in a building, under their jurisdiction. The Asbestos abatement contractor is responsible for routing the electric power to the abatement Work Area.

All temporary lighting and temporary electrical service for Work Area shall be in weatherproof enclosures and be ground fault protected.

D. In leased spaces, arrangements for water supplies and electricity must be made with the landlord. However, all such arrangements must be made through and are subject to approval of the Department of Design and Construction. Utilities will be provided at no cost to the Asbestos abatement contractor. However, it is the Asbestos abatement contractor's (or the General contractor's) responsibility to furnish and install a suitable distribution system to the Work Area. This system will be provided at no cost to the City.

#### **1.15 FEES**

The Asbestos abatement contractor shall be responsible for any and all fees or charges imposed by Local, State or Federal Law, Rule and Regulation applicable to the work specified herein, including fees or charges which may be imposed subsequent to the date of the Bid opening.

**END OF SECTION**



## SECTION 028213

### ASBESTOS ABATEMENT

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. The Contract Documents are as defined in the "Agreement". The General Conditions shall apply to all Work of this Section.
- B. Work specified herein shall be the removal and disposal of Asbestos-Containing Materials (ACM) and asbestos-contaminated materials from designated areas of the Harper Street Yard, located at 32-11 Harper Street, Queens, New York.
- C. The phasing and scheduling of work for this project shall be coordinated with and approved by the Construction Project Manager and Facility Manager. The Construction Project Manager and Facility Manager will make the final determination on all issues under this Contract covered by this Specification.

##### 1.02 SCOPE OF WORK

- A. Contractor is to provide all labor, materials, equipment, services, testing, appurtenances, permits and agreements necessary to perform the work required for the abatement of ACM as required by these contract documents. All work shall be performed in accordance with this Specification, EPA regulations, OSHA regulations, New York City Local Law 70, Title 15, Chapter 1 RCNY, New York State Industrial Code 56, NIOSH recommendations, and any other applicable federal, state or local government regulations. Whenever there is a conflict or overlap of the above references, the most stringent provisions are applicable.
- B. The intent of this Specification section is to ensure that Contractor is responsible for the following:
  - 1. Abatement of all ACM.
  - 2. Cleaning and decontamination of the entire affected area.
  - 3. Demolition that may be required to access ACM in each area, Contractor shall dispose of all debris associated with demolition activities as ACM waste.
  - 4. Removal and disposal of all ACM found within these areas such as base flashing and corrugated transite ceiling paneling.

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5. Provide all scaffolding, platform installation, equipment, tools, transportation and any other equipment required and/or necessary to complete all work described in the Contract Documents.
  6. The Contractor shall be responsible for and shall include in its Bid any and all fees or changes imposed by Local, State or Federal Law, Rule or Regulation applicable to the work specified herein, including fees or charges which may be imposed subsequent to the date of the Bid opening.
  7. Prior to destructive demolition activities and when the electrical panel boards are de-energized, the DDC may elect to collect bulk samples of the electrical panel boards and analyze the bulk samples for asbestos content.
  8. Prior to destructive demolition activities, the DDC may elect to collect bulk samples of assumed asbestos-containing materials and analyze the bulk samples for asbestos content.
- C. Contractor shall perform the following work as described below and indicated on the drawings. The drawings are only a diagrammatic representation of the Work Areas and do not constitute the actual quantities of material. Contractor is responsible for the confirmation of the actual total quantities of the Work to be performed prior to Bidding.

### 1. Drawing H001.00: Building 4 First Floor Plan

- a. Remove and dispose of corrugated transite ceiling paneling in Work Area 1 utilizing full containment procedures.

Work Area	Removal Procedure	Approximate Square Feet (Sq. Ft.)	Approximate Linear Feet (Ln. Ft.)
1	NYCDEP Full Containment	3,500 Sq. Ft. of corrugated transite ceiling paneling	—

### 2. Drawing H002.00: Buildings 4 and 5 Roof Plan

- a. Remove and dispose of asbestos-containing roof base flashing within Work Area 2. Asbestos-containing roofing material shall be removed utilizing NYCDEP Title 15, Chapter 1 § 1-107 Foam Procedure for Roof Removal. The Contractor shall be responsible for the removal and disposal of all roofing components, including but not limited to roof membrane and roof flashing down to the substrate/deck.

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Work Area	Removal Procedure	Approximate Square Feet (Sq. Ft.)	Approximate Linear Feet (Ln. Ft.)
2	NYCDEP Section § 1-107 Foam Procedure for Roof Removal	1,100 Sq. Ft. of Roof Base Flashing	—

- D. The facility is under the jurisdiction of the New York City Department of Transportation. The contractor shall perform the work of this contract in a manner that will be least disruptive to the normal use of the building.
- E. Contractor's attention is directed to the fact that patents cover certain methods of asbestos abatement indicated in the specifications. To date, patents have been issued with regard to negative pressure enclosures or negative or reduced pressure and glove-bag.
- F. Contractor shall be solely responsible for and shall hold the City of New York Department of Design and Construction and the City harmless from, any and all damages, losses and expenses resulting from any infringement by Contractor of any patent, including but not limited to the patents described above, used by Contractor during performance of this agreement.
- G. Prior to starting, the General Contractor must notify the Commissioner of the City of New York Department of Design and Construction if he anticipates any difficulty in performing the work as directed and required by these Specifications. Contractor shall be required to attend an on-site job meeting with the Construction Project Manager prior to start of work to examine conditions of the site for removal and plan the sequence for removal operations.
- H. The Contractor shall retain a certified Project Designer for the preparation of an Asbestos Variance Application (ACP-9), if required.
- I. The Contractor shall be responsible for preparing and submitting all filings, notifications, amendments and variances, etc. required by all City, State and Federal regulatory agencies having jurisdiction, at no additional cost to the NYC DDC.
- J. The Contractor shall retain a registered design professional (person licensed and registered to practice the professions of architecture or engineering under the Education Law of the State of New York) to prepare a Work Place Safety Plan (WPSP), if required.
- K. For coordination with other Contractors, see the General Conditions governing all Contracts.
- L. Related Asbestos Removal Work Under Other Contracts:

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1. Each Contractor shall be responsible for the removal of incidental asbestos not identified in this section and found prior to or during the Work.
2. Incidental asbestos is defined as ACM that is discovered during the course of their work that must be abated to enable them to perform the work of their Contract.

### M. Work Hours:

1. The Contractor shall establish his work schedule in a way that avoids interference or conflict with the normal functioning of the facility. Work in the evenings shall be done at no additional cost to the City.
2. All work shall be done during regular working hours unless the Contractor requests authorization to work other than regular working hours and such authorization is granted by the Commissioner. (Regular working hours are those during which any given facility in which work is to be done is customarily open and functioning). If such work schedule is authorized by the Commissioner the work shall be done at no additional cost to the City.
3. The order of phases and start dates associated with each will be determined by the Construction Project Manager.
4. Contractor shall be required to schedule waste transfer during evening hours, when activity within the facility is at a minimum. Evening hours are defined as 6:00 p.m. to 6:00 a.m. Waste transfer must be approved by the Construction Project Manager and Facility Manager.

### N. The following conditions shall apply to all temporary shutdowns of existing services.

1. All temporary lighting and temporary electrical services for use in the Work Area shall be in weather proof enclosures and be ground fault protected and:
2. Shall be performed at no additional charge to the City.
3. Shall be performed at times not interfering with the other activities in the building.
4. Shall be performed only with written consent from the Commissioner and the Facility Manager.
5. Shall be made through written request to the Commissioner at least 10 days in advance with complete written description of the work to be performed.



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### O. Stages of Asbestos Removal Work:

- a. The Abatement Contractor will be required to perform the work and it is the intent of this Specification to remove all asbestos containing and asbestos contaminated materials from the Work Area. The Contractor is responsible for verifying all quantities of materials listed here and Bid accordingly.

- P. Certain equipment in the Work Area may need to remain operational during removal. Therefore, the removal of ACM from this equipment shall be performed as the last removal activities within the Work Area. The Contractor shall coordinate the scheduling for the removal of ACM on functioning equipment with the Construction Project Manager.

### 1.03 SPECIAL EXPERIENCE REQUIREMENTS FOR ASBESTOS ABATEMENT

- A. General: The special experience requirements set forth in Paragraph B below apply to the bidder for this contract.

1. Evaluation: Compliance with the special experience requirements will be evaluated at the time of the bid. The bidder is advised that failure to meet such special experience requirements will result in the rejection of the bid as non-responsive. Compliance with the experience requirements set forth herein will be determined solely by the City.
2. Compliance by the Bidder as an Entity: Compliance with the special experience requirements must be demonstrated by the BIDDER ITSELF, i.e., the actual entity submitting the bid. The bidder itself must have been in existence as the same entity for the three year period prior to the bid opening. During such period, the bidding entity itself must have achieved compliance with the special experience requirements. The bidding entity may not use or rely on the experience or credentials of any other entity; regardless of any relationship such other entity may have to the bidder.

- B. Requirements: The bidder must demonstrate compliance with the special experience requirements set forth in subparagraphs (1) through (5) below. The bidder must, as part of its bid, submit documentation demonstrating compliance with all listed requirements. Such documentation shall include without limitation, all required licenses, certificates, and documentation.

1. The bidder must, whether an individual, corporation, partnership, joint venture or other legal entity, must demonstrate for the three year period prior to the bid opening, that it has been licensed by the New York State Department of Labor, as an "Asbestos Contractor"

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2. The bidder must, for the three year period prior to the bid opening, have been in the business of providing asbestos abatement services as a routine part of its daily operations
  3. The bidder (contractor) proposing to do asbestos abatement work must be thoroughly experienced in such work and must provide evidence of having successfully performed and completed in a timely fashion at least five(5) asbestos abatement projects of similar size and complexity. The aggregate cost of these projects must be at least \$1,000,000 in each of the three years.
  4. For each project submitted to meet the experience requirements set forth above, the bidder must submit the following information for the project; name and location of the project; name title and telephone number of the owner or the owner's representative who is familiar with the bidder's work, brief description of the work completed as a prime or sub-contractor; amount of contract or subcontract and the date of completion.
  5. The bidder must demonstrate that it has the financial resources, supervisory personnel and equipment necessary to carry out the work and to comply with the required performance schedule, taking into consideration other business commitments. The bidder must submit such documentation as may be required by the Department of Design and Construction to demonstrate that it has the requisite capacity to perform the required services of this contract.
- C. Throughout the specifications, reference is made to codes and standards which establish qualities and types of workmanship and materials, and which establish methods for testing and reporting on the pertinent characteristics thereof. Provide materials or workmanship that meet or exceed the specifically named codes or standards where required by these specifications.
- D. Site Investigation: Contractor shall inspect all the specifications and related drawings, and will investigate and confirm the site conditions affecting the work, including, but not limited to:
1. Physical considerations and conditions of both the material and structure. These considerations include any obstacles or obstructions encountered in accessing or removing the material.
  2. Handling, storage, transportation and disposal of the material.
  3. Availability of qualified and skilled labor.
  4. Availability of utilities.
  5. Exact quantities of all materials to be disturbed and/or removed.

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### 1.04 WORK BY OTHERS

The City reserves the right during the term of this Contract to have work performed on asbestos abatement projects by other Contractors as the situation warrants.

### 1.05 DEFINITIONS

- A. General Explanation: Certain terms used in this Specification Section are defined below. Definitions and explanations of this Specification Section are not necessarily complete or exclusive, but are general for the Work to the extent they are not stated more explicitly in another element of the Contract Documents.
- B. Definitions in General Use:
1. Approve: Where used in conjunction with Engineer's response to submittals, requests, applications, inquiries, reports and claims by Contractor, the meaning of term "approved" will be held to limitations of Engineer's responsibilities and duties as specified in Contract Documents. In no case will "approval" by Engineer be interpreted as a release of Contractor from responsibilities to fulfill requirements of Contract Documents.
  2. Directed, Requested, etc.: Where not otherwise explained, terms such as "directed," "requested," "authorized," "selected," "approved," "required," "accepted," and "permitted" mean "directed by Engineer," "requested by Engineer," and similar phrases. However, no such implied meaning will be interpreted to extend Engineer's responsibility into Contractor's responsibility for construction supervision.
  3. Furnish: Except as otherwise defined in greater detail, term "furnish" is used to mean supply and deliver to project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance.
  4. Indicated: The term "indicated" is a cross-reference to graphic representations, notes or schedules on Drawings, to other paragraphs or schedules in the Specifications, and to similar means of recording requirements in Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used in lieu of "indicated," it is for purpose of helping reader locate cross-reference, and no limitation of location is intended except as specifically noted.
  5. Install: Except as otherwise defined in greater detail, term "install" is used to describe operations at Project site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance.

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6. **Installer:** The term "installer" is defined as the entity (person or firm) engaged by Contractor, or its subcontractor or sub-subcontractor for performance of a particular unit of work at Project site, including installation, erection, application and similar required operations. It is a general requirement that such entities (installers) be expert in operations they are engaged to perform.
7. **Provide:** Except as otherwise defined in greater detail, term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.
8. **Third-Party Air Monitor :** The term "Third-Party Air Monitor " is defined as an entity engaged by City and Construction Project Manager to perform specific inspections or tests of the work, either at Project site or elsewhere; and to report and (if required) interpret results of those inspections or tests.

### C. Definitions Relative to Asbestos Abatement:

1. **Abatement:** Any and all procedures physically taken to control fiber release from asbestos-containing materials. This includes removal, encapsulation, enclosure, cleanup and repair.
2. **Adequately Wet:** the complete penetration of a material with amended water to prevent the release of particulates. If visible emissions are observed coming from asbestos-containing material, then the material has not been adequately wetted. However, the absence of visible emissions is not evidence of being adequately wet. ACM must be fully penetrated with the wetting agent in order to be considered adequately wet. If the ACM being abated is resistant to amended water penetration, wetting agent shall be applied to the material prior to and during removal as necessary to minimize fiber release.
3. **Aggressive Sampling:** Method of sampling in which the individual collecting the air sample creates activity by the use of mechanical equipment during the sampling period to stir up settled dust and simulate activity in that area of the building.
4. **AHERA:** The Asbestos Hazard Emergency Response Act of 1986
5. **AIHA:** American Industrial Hygiene Association.
6. **Airlock:** System for permitting entrance and exit while restricting air movement between a contaminated area and an uncontaminated area. It consists of two curtained doorways separated by a distance of at least three feet such that one passes through one doorway into the airlock, allowing the doorway sheeting to overlap and close off the opening before proceeding

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through the second doorway, thereby preventing flow-through contamination.

7. **Air Sampling:** Process of measuring the fiber content of a known volume of air collected during a specific period. The procedure utilized for asbestos follows the NIOSH Standard Analytical Method 7400, or the provisional transmission electron microscopy methods developed by the US EPA which is utilized for lower detection levels and specific fiber identification.
8. **Ambient Air Monitoring:** "Ambient air monitoring" shall mean measurement or determination of airborne asbestos fiber concentrations outside but in the general vicinity of the worksite.
9. **Amended Water:** Water to which a surfactant has been added.
10. **ANSI:** American National Standards Institute
11. **Area Air Sampling:** Any form of air sampling or monitoring where the sampling device is placed at some stationary location.
12. **Asbestos:** Any hydrated mineral silicate separable into commercially usable fibers, including but not limited to chrysotile (serpentine), amosite (cumingtonite-grunerite), crocidolite (riebeckite), tremolite, anthophyllite and actinolite.
13. **Asbestos-Containing Material (ACM):** Asbestos or any material containing more than one-percent asbestos.
14. **Asbestos-Containing Waste Material:** ACM, asbestos-contaminated objects or debris associated with asbestos abatement requiring disposal.
15. **Asbestos-contaminated Objects:** Any objects which have been contaminated by asbestos or asbestos-containing material.
16. **Asbestos Assessment Report:** "Asbestos Assessment Report" shall mean the "Form ACP-5" form, as approved by NYCDEP, by which a NYCDEP-certified asbestos investigator certifies that a building or structure (or portion thereof) is free of ACM or the amount of ACM to be abated constitutes a minor project.
17. **Asbestos Handler:** Individual who disturbs, removes, repairs, or encloses asbestos material. This individual shall have completed approved training course(s) and be in possession of certification issued by NYCDEP and NYSDOL.
18. **Asbestos Handler Supervisor:** Individual who supervises the handlers during an asbestos project and ensures that proper asbestos abatement procedures

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as well as individual safety procedures are being adhered to. This individual shall have completed approved training course(s) and be in possession of certification issued by NYCDEP and NYSDOL.

19. Asbestos Investigator: An individual certified by NYCDEP as having successfully demonstrated his or her ability to identify the presence of and evaluate the condition of asbestos in a building or structure.
20. Asbestos Project: Any form of work performed in connection with the alteration, innovation, modification, or demolition of a building or structure which will disturb (e.g. remove, enclose, encapsulate) more than more than 25 linear feet or more than 10 square feet of asbestos-containing material.
21. ASTM: the American Society for Testing and Materials.
22. Asbestos Project Notification: The "Form ACP-7" asbestos project notification form as approved by DEP.
23. Authorized Visitor: Authorized visitor shall mean the building owner and his/her representative, and any representative of a regulatory or other agency having jurisdiction over the project.
24. Building Owner: Person in whom legal title to the premises is vested unless the premises are held in land trust, in which instance Building Owner means the person in whom beneficial title is vested.
25. Building Materials: Any and all manmade materials, including but not limited to interior and exterior finishes, equipment, bricks, mortar, concrete, plaster, roofing, flooring, caulking, sealants, tiles, insulation, and outdoor paving such as sidewalks, paving tiles and asphalt.
26. Certified Industrial Hygienist (CIH): Individual with a minimum of five years experience as an industrial hygienist and who has successfully completed both levels of the examination administered by the American Board of Industrial Hygiene and who is currently certified by that board.
27. Certified Safety Professional (CSP): Individual having a bachelor's degree from an accredited college or university and a minimum of four years experience as a safety professional and who has successfully completed both levels of the examination administered by the Board of Certified Safety Professionals and who is currently certified by that board.
28. Chain of Custody: "Chain of custody" shall mean the form or set of forms that document the collection and transfer of a sample.
29. City: City of New York

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30. Clean Room: An uncontaminated area or room that is part of worker decontamination enclosure system with provisions for storage of workers' street clothes and protective equipment.
31. Clearance Air Monitoring: Employment of aggressive sampling techniques with a volume of air collected to determine the airborne concentration of residual fibers and shall be performed as the final abatement activity.
32. Commissioner: shall mean the head of the Agency that has entered into this contract or his/her duly authorized representative.
33. Competent Person: Shall mean the designated person as defined by OSHA in 29CFR1926.1101.
34. Curtained Doorway: Device that consists of at least three overlapping sheets of fire retardant plastic over an existing or temporarily framed doorway. One sheet shall be secured at the top and left side, the second sheet at the top and right side, and the third sheet at the top and left side. All sheets shall have weights attached to the bottom to ensure that the sheets hang straight and maintain a seal over the doorway when not in use.
35. Decontamination Enclosure System: Series of connected rooms, separated from the Work Area and from each other by air locks, for the decontamination of workers, materials, waste containers, and equipment.
36. Demolition: The dismantling or razing of a building, including all operations incidental thereto (except for asbestos abatement activities), for which a demolition permit from the New York City Department of Buildings is required.
37. NYCDEP or DEP: The New York City Department of Environmental Protection.
38. Disturb: Any action taken which may alter, change, or stir, such as but not limited to the removal, encapsulation, enclosure or repair of asbestos-containing material.
39. DOB: The New York City Department of Buildings.
40. Egress: A continuous and unobstructed path of vertical and horizontal egress travel from any occupied portion of a building or structure to a public way. A means of egress consists of three separate and distinct parts: the exit access, the exit and the exit discharge.
41. ELAP: Environmental Laboratory Approval Program administered by the New York State Department of Health.

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42. Encapsulant (sealant) or Encapsulating Agent: Liquid material which can be applied to ACM and which temporarily controls the possible release of asbestos fibers from the material either by creating a membrane over the surface (bridging encapsulant) or by penetrating into the material and binding its components together (penetrating encapsulant). A thin coat of lockdown encapsulant shall be applied to all surfaces in the work area which were not the subject of removal or abatement, including the cleaned layer of the surface barriers, but excepting sprinklers, standpipes, and other active elements of the fire suppression system.
43. Encapsulation: The coating or spraying of asbestos-containing material encapsulant. A thin coat of lockdown encapsulant shall be applied to all surfaces in the work area which were not the subject of removal or abatement, including the cleaned layer of the surface barriers, but excepting sprinklers, standpipes, and other active elements of the fire suppression system.
44. Enclosure: Construction of airtight walls and/or ceilings between ACM and the facility environment, or around surfaces coated with ACM, or any other appropriate procedure as determined by the NYCDEP which prevents the release of asbestos fibers.
45. EPA or USEPA: United States Environmental Protection Agency.
46. Equipment Room: Contaminated area or room that is part of the worker decontamination enclosure system with provisions for the storage of contaminated clothing and equipment.
47. Exit: That portion of a means of egress system which is separated from other interior spaces of a building or structure by fire-resistance-rated construction to provide a protected path of egress travel between the exit access and the exit discharge.
48. FDNY: The Fire Department of the City of New York.
49. Fiber: An acicular single crystal or a similarity elongated polycrystalline aggregate which displays some resemblance to organic fibers by having such properties as flexibility, high aspect ratio, silky luster, axial lineation, and others, and which has attained its shape primarily through growth rather than cleavage.
50. Fixed Object: A unit of equipment, furniture, or other item in the work area which cannot be removed from the work area. Fixed objects shall include equipment, furniture, or other items that are attached, in whole or in part, to a floor, ceiling, wall, or other building structure or system or to another fixed object and cannot be reasonably removed from the work area. Fixed objects shall also include pipes and other equipment inside the work area



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which are not the subject of the asbestos project. Active fire suppression system components shall not be considered fixed objects.

51. "Glovebag technique" shall mean a method for removing asbestos-containing material from heating, ventilation and air conditioning (HVAC) ducts, short piping runs, valves, joints, elbows, and other nonplanar surfaces. The glovebag assembly is a manufactured device consisting of a large bag (constructed of at least 6-mil transparent plastic), two inward-projecting long sleeve gloves, one inward-projecting waterwand sleeve, an internal tool pouch, and an attached, labeled receptacle for asbestos waste. The glovebag is constructed and installed in such a manner that it surrounds the object or area to be decontaminated and contains all asbestos fibers released during the removal process.
52. HEPA-Filter: High efficiency particulate air filter capable of trapping and retaining 99.97 percent of particles (asbestos fibers) greater than 0.3 micrometers mass median aerodynamic equivalent diameter.
53. HEPA vacuum equipment: "HEPA vacuum equipment" shall mean vacuuming equipment with a HEPA filter.
54. Holding Area: Chamber in the equipment decontamination enclosure located between the washroom and an uncontaminated area.
55. Homogeneous Work Area: Portion of the Work Area that contains one type of ACM and/or where one type of abatement is used.
56. Industrial Hygiene: Science and art devoted to the recognition, evaluation, and control of those environmental factors or stresses, arising in or from the work place, which may cause sickness, impaired health and well being, or significant discomfort and inefficiency among worker or among the citizens of the community.
57. Industrial Hygienist: Individual having a college or university degree or degrees in Engineering, Chemistry, Physics or Medicine, or related Biological Sciences who, by virtue of special studies and training, has acquired competence in industrial hygiene. Such special studies and training must have been sufficient in all of the above cognate sciences to provide the abilities:
  - a. To recognize the environmental factors and to understand their effect on people and their well being; and
  - b. To evaluate, on the basis of experience and with the aid of quantitative measurement techniques, the magnitude of these stresses in terms of ability to impair people's health and well being; and

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- c. To prescribe methods to eliminate, control, or reduce such stresses when necessary to alleviate their efforts.
- 58. Isolation Barrier: The construction of partitions, the placement of solid materials, and the plasticizing of apertures to seal off the work place from surrounding areas and to contain asbestos fibers in the work area.
- 59. Large Asbestos Project: Asbestos project involving the disturbances (e.g. removal, enclosure, encapsulation) of 260 linear feet or more of ACM or 160 square feet or more of ACM.
- 60. Log: An official record of all activities that occurred during the project. At a minimum, the log shall identify the building owner, agent, contractor, and workers, and other pertinent information including daily activities, cleanings and waste transfers, names and certificate numbers of asbestos handler supervisors and asbestos handlers; results of inspections of decontamination systems, barriers, and negative pressure ventilation equipment; summary of corrective actions and repairs; work stoppages with reason for stoppage; manometer readings at least twice per work shift; daily checks of emergency and fire exits and any unusual events.
- 61. Minor Project: A project involving the disturbance (e.g. removal, enclosure, encapsulation, repair) of 25 linear feet or less of asbestos containing material or 10 square feet or less of asbestos containing material.
- 62. Movable Object: Unit of equipment or furniture in the Work Area that can be removed from the Work Area.
- 63. Negative Air Pressure Equipment: Portable local exhaust system equipped with HEPA filtration. The system shall be capable of creating a negative pressure differential between the outside and inside of the Work Area.
- 64. NESHAPS: National Emission Standards for Hazardous Air Pollutants
- 65. NFPA: The National Fire Protection Association.
- 66. NIOSH: National Institute for Occupational Safety and Health.
- 67. DEP or NYCDEP: New York City Department of Environmental Protection
- 68. NYSDOL: New York State Department of Labor.
- 69. NYSDOL ICR 56: "NYSDOL ICR 56" shall mean Part 56 of the Official Compilation of Codes, Rules and Regulations of the State of New York or 12 NYCRR Part 56.
- 70. NYSDOH: The New York State Department of Health.

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71. Obstruction: The blocking of a means of egress with any temporary structure or barrier. A double layer of fire-retardant 6-mil polyethylene sheeting shall not be considered an obstruction when it is prominently marked as an exit with photoluminescent signage or paint and cutting tools (knife, razor) are attached to the work area side of the sheeting for use in the event that the sheeting must be cut to permit egress. A corridor shall not be considered obstructed when there is a clear path measuring at least three (3) feet wide.
72. Occupied Area: Area of the work site where abatement is not taking place and where personnel or occupants normally function or where workers are not required to use personal protective equipment.
73. OSHA: Occupational Safety and Health Administration.
74. Outside air: "Outside air" shall mean the air outside the work place.
75. Person: Individual, partnership, company, corporation, association, firm, organization, governmental agency, administration, or department, or any other group of individuals, or any officer or employee thereof.
76. Personal Air Monitoring: Method used to determine employees' exposure to airborne asbestos fibers. The sample is collected outside the respirator in the worker's breathing zone.
77. Personal Protective Equipment (PPE): Appropriate protective clothing, gloves, eye protection, footwear, and head gear.
78. Phase Contrast Microscopy: The measurement protocol for the assessment of the fiber content of air. (NIOSH Method 7400).
79. Physician: Person licensed or otherwise authorized under Article 131 Section 65.22 of the New York State Education Law.
80. Plasticize: To cover floors and walls with fire retardant plastic sheeting as herein specified or by using spray plastics as acceptable to the Department.
81. Polarized light microscopy: The measurement protocol for the assessment of the asbestos content of bulk materials. (Interim Method for the Determination of Asbestiform Materials in Bulk Insulation Samples- 40 CFR Part 763, Subpart F, Appendix A as amended on September 1, 1982)
82. Project Designer: A person who holds a valid Project Designer Certificate issued by the New York State Department of Labor.

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83. **Project Monitor:** A person who holds a valid Project Monitor Certificate issued by the New York State Department of Labor.
84. **Qualitative Fit Test:** Individual test subject's responding (either voluntarily or involuntarily) to a chemical challenge outside the respirator face-piece. Acceptable methods include irritant smoke test, odorous vapor test, and taste test.
85. **Quantitative Fit Test:** Exposing the respiratory wearer to a test atmosphere containing an easily detectable, nontoxic aerosol, vapor or gas as the test agent. Instrumentation, which samples the test atmosphere and the air inside the face-piece of the respirator, is used to measure quantitatively the leakage into the respirator. There are a number of test atmospheres, test agents, and exercises to perform during the test.
86. **Registered Design Professional:** A person licensed and registered to practice the professions of architecture or engineering under the Education Law of the State of New York.
87. **Removal:** Stripping of any asbestos- containing materials from surfaces or components of a facility or taking out structural components in accordance with 40 CFR 61 Subparts A and M.
88. **Renovation:** An addition or alteration or change or modification of a building or the service equipment thereof, that is not classified as an ordinary repair as defined in §27-125 of the Administrative Code of the City of New York.
89. **Repair:** Corrective action using specified work practices e.g. glovebag, plastic tent procedures, etc. to minimize the likelihood of fiber release from minimally damaged areas of ACM.
90. **Replacement material:** Any material used to replace ACM that contains less than .01 percent asbestos.
91. **Shift:** A worker's, or simultaneous group of workers', complete daily term of work.
92. **Shower Room:** Room between the clean room and the equipment room in the worker decontamination enclosure with hot and cold running water controllable at the tap and arranged for complete showering during decontamination.
93. **Small Asbestos Project:** asbestos project involving the disturbance (e.g. removal, enclosure, encapsulation) of more than 25 and less than 260 linear feet of ACM or more than ten and less than 160 square feet of ACM.

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94. Staging Area: Work Area near the waste transfer airlock where containerized asbestos waste has been placed prior to removal from the Work Area.
95. Strip. To remove asbestos materials from any part of the facility.
96. Structural Member: Load-supporting member of a facility, such as beams and load-supporting walls, or any non-load-supporting member, such as ceiling and non-load-supporting walls.
97. Surface barriers: The plasticizing of walls, floors, and fixed objects within the work area to prevent contamination from subsequent work.
98. Surfactant: Chemical wetting agent added to water to improve penetration.
99. Transmission Electron Microscopy (TEM). The measurement protocol for the assessment of the asbestos fiber content of air. (Interim Transmission Electron Microscopy Analytical Methods-40 CFR Part 763, Subpart E, Appendix A.
100. Visible Emissions: Emissions containing particulate material that are visually detectable without the aid of instruments.
101. Washroom: Room between the Work Area and the holding area in the equipment decontamination enclosure system where equipment and waste containers are wet cleaned and/or HEPA-vacuumed prior to disposal.
102. Waste decontamination enclosure system: "Waste decontamination enclosure system" shall mean the decontamination enclosure system designated for the controlled transfer of materials and equipment, consisting of a washroom and a holding area.
103. Wet Cleaning: "Wet cleaning" shall mean the removal of asbestos fibers from building surfaces and objects by using cloths, mops, or other cleaning tools which have been dampened with water.
104. Wet methods: "Wet methods" shall mean the use of amended water or removal encapsulants to minimize the generation of fibers during ACM disturbance.
105. Work Area: Designated rooms, spaces, or areas of the building or structure where asbestos abatement activities take(s) place.
106. Worker Decontamination Enclosure System: Portion of a decontamination enclosure system designed for controlled passage of workers and authorized visitors, consisting of a clean room, a shower room, and an equipment room

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separated from each other and from the Work Area by airlocks and curtained doorways.

- 107. Work Place: The work area and the decontamination enclosure system(s).
- 108. Work Place Safety Plan: Construction documents prepared by a registered design professional and submitted for review by DEP in order to obtain an asbestos abatement permit. Such plan shall include, but not be limited to, plans, sections, and details of the work area clearly showing the extent, sequence, and means and methods by which the work is to be performed.
- 109. Work Site: Premises where abatement activity is being performed. May be composed of one or more Work Areas.

### 1.06 STANDARD OPERATING PROCEDURES

- A. Develop and implement a written standard procedure for abatement work to ensure maximum protection and safeguard from asbestos exposure of the workers, visitors, employees, public, and environment.
- B. TELEPHONE PAGING DEVICE

The Contractor or his authorized representative shall, at all times during the normal workday or during periods of overtime work under this Contract, carry a digital telephone paging device ("Beeper") and/or cellular telephones which can be activated by a telephone number in the 212 or 646 or 718 or 917 area code. He shall supply the Department of Design and Construction with the activation number for the device and he is liable to respond back to the calls from DDC within the next one (1) hour period after he receives calls from DDC. The cost to the contractor for this device and all charges accruing thereto is deemed included in the Bid.

- C. The standard operating procedure shall ensure:
  - 1. Tight security from unauthorized entry into the workspace.
  - 2. Restriction of Contractor's personnel to the immediate Work Area and access/egress routes.
  - 3. Donning of proper protective clothing and respiratory protection prior to entering the Work Area.
  - 4. Safe work practices in the work place, including provisions for inter-room communications, exclusion of eating, drinking, smoking, or in any way breaking the respiratory protection.

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5. Proper exit practices from the work space to the outside through the showering and decontamination facilities.
  6. Removing asbestos in a way that minimizes release of fibers.
  7. Packing, labeling, loading, transporting, and disposing of contaminated material in a way that minimizes exposure and contamination.
  8. Emergency evacuation procedures, for medical or safety situations, to minimize the potential exposure to airborne asbestos fibers for emergency personnel, building occupants, and building environment.
  9. Safety from accidents in the workspace, especially from electrical shocks, fall hazards associated with scaffolding, slippery surfaces, and entanglements in loose hoses and equipment.
  10. Provisions for effective supervision, air monitoring and personnel monitoring for exposure during the work.
  11. Engineering controls that minimize exposure to fibers within the workspace.
  12. The contractor shall provide a 24-hour fire watch throughout the entire term of the project, to protect against fire and unauthorized entry into the workspace. Fire watch shall be performed by an individual who is a certified asbestos worker capable of entering the Work Area for regular inspections.
- D. Provide an Asbestos Handler Supervisor to provide continuous supervision of all work, and to be responsible for the following:
1. Ensure that individuals are using proper personal protective equipment and are trained in its use.
  2. Maintain entry log records and ensure that they are recorded in accordance with the provisions of Title 15, Chapter 1 of RCNY.
  3. Surveillance of the Work Areas at a minimum of once per work shift or as required by Title 15, Chapter 1 of RCNY, to ensure that the workers personal protective equipment is not torn or ripped and that respiratory protection is worn at all times.
  4. Ensure that sufficient personal protective equipment is stored in the clean room.
  5. Take precautions to prevent heat stress. Precautions include, but are not limited to, selecting lightweight protective clothing, reducing the work rate, and providing adequate fluid breaks.

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6. Perform work area inspection with project monitor prior to the commencement of final clearance air monitoring.
7. The contractor shall retain the asbestos handler supervisor to perform a visual inspection prior to the post-abatement clearance air monitoring to confirm that all containerized waste has been removed from work and holding areas and there is no visible ACM debris or residue on or about all abated surfaces.

### E. ENGINEERING CONTROLS

1. The 8-hour time weighted average airborne concentration of fibers to which any passerby may be exposed shall not exceed 0.01 fibers per cubic centimeter of air when fibers have a physical dimension longer than 5 micrometers as determined by the method prescribed in these Specifications.
2. All asbestos projects shall utilize negative pressure ventilation equipment.
  - a. The Contractor shall use a manometer to document the pressure differential. The Contractor shall install and make the manometer operational once the negative pressure has been established in the work area. Magnahelic manometers shall be calibrated at least every six months and a copy of the current calibration certification shall be available at the work site.
3. Negative pressure ventilation equipment shall be installed and operated to provide at least one air change in the work area every 15 minutes. Where there are no floor or wall barriers because floor or wall material is being abated, there shall be at least one air change in the work area every ten minutes.
4. The negative pressure ventilation equipment shall operate continuously, 24 hours a day, from the establishment of isolation barriers through successful clearance air monitoring. If such equipment shuts off, adjacent areas shall be monitored for asbestos fibers.
5. A static negative air pressure of 0.02 inches (minimum) water column shall be maintained at all times in the work place during abatement to ensure that contaminated air in the Work Area does not filter back to uncontaminated areas.
6. If the contaminated area of an asbestos project covers the entire floor of the affected building, or an area greater than 15,000 square feet on any given floor, the installation of a negative air cut off switch or switches shall be required at a single location outside the work place, such as inside a stairwell, or at a secured location in the ground floor lobby when conditions warrant. The required switch or switches shall be installed by a licensed



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electrician pursuant to a permit issued by the Department of Buildings. If negative pressure ventilation equipment is used on multiple floors, the cut off switch shall be able to turn off the equipment on all floors.

7. On loss of negative pressure or electric power to the negative pressure ventilating units, abatement shall stop immediately and shall not resume until power is restored and negative pressure ventilation equipment is operating again.
8. Negative pressure ventilation equipment shall be exhausted to the outside of the building away from occupied areas.
  - a. All openings (including but not limited to operable windows, doors, vents, air intakes or exhausts of any mechanical devices) less than 15 feet from the exterior exhaust duct termination location shall be plasticized with two layers of fire retardant 6-mil polyethylene sheeting, or a second negative pressure ventilation unit with the primary unit's capacity shall be connected in series prior to exhausting to the outside.
  - b. Negative pressure ventilation equipment shall exhaust away from areas accessible to the public.
  - c. All ducting shall be sealed and braced or supported to maintain airtight joints. Ducts shall be reinforced and shall be installed so as to prevent breakage. Damage to ducts must be repaired immediately.
9. Where ducting to the outside is not possible, a second negative pressure ventilation unit compatible with the primary unit's capacity shall be connected in series. The area receiving the exhaust shall have sufficient, non-recycling exhaust capacity to the outside of the structure.
10. In the event that there is a failure of the containment system or a breach in the Isolation Barriers, all abatement work will cease and the Contractor will immediately correct the condition. Abatement work will not resume until the Work Area has been smoke tested by the third party laboratory and approved by the Construction Project Manager.

### F. LOCKDOWN ENCAPSULATION PROCEDURES

1. The following procedures shall be followed to seal in nonvisible residue while conducting lockdown encapsulation on all surfaces from which ACM has not been removed:
  - a. Only encapsulants rated as acceptable or marginally acceptable on the basis of Battelle Columbus Laboratory test procedures and rating

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requirements developed under the 1978 USEPA Contract shall be used for lockdown encapsulation.

- b. The encapsulant solvent or vehicle shall not contain a volatile hydrocarbon unless reviewed and approved by DEP.
- c. Latex paint with solids content greater than 15 percent shall be considered a lockdown sealant for coating all non-metallic surfaces.
- d. Encapsulants shall be applied using airless spray equipment. Spraying is to occur at the lowest pressure range possible to minimize fiber release from encapsulant impact at the surface. It shall be applied with a consistent horizontal or vertical motion.
- e. The cleaned layer of the surface barriers shall be removed from walls and floors.

The isolation barriers shall remain in place throughout cleanup. Decontamination enclosure systems shall remain in place and be utilized. A thin coat of lockdown encapsulant shall be applied to all surfaces in the work area which were not the subject of removal or abatement, including the cleaned layer of the surface barriers, but excepting sprinklers, standpipes, and other active elements of the fire suppression system.

### 1.07 NOTIFICATIONS, PERMITS, WARNING SIGNS, LABELS, AND POSTERS

- A. The Contractor shall submit an Asbestos Project Notification (ACP-7) to the NYCDEP listing each work area within the building separately one week in advance of the start of work.
- B. The Contractor shall obtain an asbestos abatement permit authorizing the performance of construction work as required for asbestos projects involving one or more of the following activities:
  - 1. Obstruction of an exit door leading to an exit stair or the exterior of the building;
  - 2. Obstruction of an exterior fire escape or access to that fire escape;
  - 3. Obstruction of a fire-rated corridor leading to an exit door;
  - 4. Removal of handrails in an exit stair or ramp;
  - 5. Removal or dismantling of any fire alarm system component including any fire alarm-initiating device (e.g., smoke detectors, manual pull station);

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6. Removal or dismantling of any exit sign or any component of the exit lighting system, including photoluminescent exit path markings;
  7. Removal or dismantling of any part of a sprinkler system including piping or sprinkler heads;
  8. Removal or dismantling of any part of a standpipe system including fire pumps or valves;
  9. Removal of any non-load bearing / non-fire-rated wall (greater than 45 square feet or 50 percent of a given wall);
  10. Any plumbing work other than the repair or replacement of plumbing fixtures;
  11. Removal of any fire-resistance rated portions of a wall, ceiling, floor, door, corridor, partition, or structural element enclosure including spray-on fire resistance rated materials;
  12. Removal of any fire damper, smoke damper, fire stopping material, fire blocking, or draft stopping within fire-resistance rated assemblies or within concealed spaces;
  13. Any work that otherwise requires a permit from the DOB (full demolitions, alterations, renovations, modifications or plumbing work).
- C. The contractor shall provide a floor plan showing the areas of the building under abatement and the location of all fire exits in said areas. It shall be prominently posted in the building lobby or comparable location, along with a notice stating the location within the building of the negative air cutoff switch, if applicable.
- D. The Contractor shall submit, as required, an asbestos abatement permit due to one or more of the activities listed in 1.07 (B) (1-8) and (B) (13). The contractor is responsible for submitting, with an asbestos project notification, a work place safety plan (WPSP) and any other applicable construction documents. These documents must be prepared by a registered design professional (Professional Engineer or Registered Architect).
- E. A WPSP is not required for projects requiring an asbestos abatement permit due to one or more of the activities listed in 1.07 (B) (9-12). The Contractor shall submit, together with the asbestos project notification, all applicable asbestos abatement permit construction documents.
- F. The Contractor shall perform the inspections required pursuant to Title 28 of the Administrative Code, including but not limited to special inspections required by Chapter 17 of the Building Code, shall be performed as follows:

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1. A final inspection shall be performed by a registered design professional retained by the Contractor after all work authorized by the asbestos abatement permit is completed. The person performing the inspection shall note all failures to comply with the provisions of the Building Code or approved asbestos abatement permit and shall promptly notify the owner in writing. All defects noted in such inspection shall be corrected. The final inspection report shall either:
  - a. Confirm:
    - (1) That the construction work is complete, including the reinstallation or reactivation of any building fire safety or life safety component.
    - (2) That any defects previously noted have been corrected.
    - (3) That all required inspections were performed.
    - (4) That the work is in substantial compliance with the approved asbestos abatement permit construction documents, the Building Code, and other applicable laws and rules.
  - b. Confirm:
    - (1) That the construction work does not return the building (or portion thereof) affected by the abatement project to a condition compliant with the building code and other applicable laws and rules, but that the registered design professional has reviewed an application for asbestos abatement permit construction documents approval that has been approved by the department of buildings, and the subsequent scope of work as approved will, upon completion, render all areas affected by the asbestos project in full compliance with the building code and all applicable laws and rules.
    - (2) That any defects previously noted that are not addressed by the subsequent scope of work as approved by the department of buildings, have been corrected.
    - (3) That all required inspections that are not addressed by the subsequent scope of work as approved by the department of buildings were performed.
    - (4) That all completed work pursuant to an asbestos abatement permit is in substantial compliance with the approved asbestos abatement permit construction documents.

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- G. The contractor shall provide the final inspection reports to be filed with DEP on A-TR1 form. Records of final inspections made by registered design professionals shall be submitted to DDC as part of the close out document package.
- H. Erect bilingual (English-Spanish) warning signs around the work space and at every point of potential entry from the outside and at main entrance to building which can be viewed by the public without obstruction, in accordance with OSHA 29 CFR 1926.1101 (K) (Sign Specifications) and Title 15, Chapter 1 of RCNY. The warning signs shall be a bright color so that they will be easily noticeable. The size of the sign and the size of the lettering shall be no less than OSHA requirements.
- I. Provide the required labels for all polyethylene bags and all drums utilized to transport contaminated material to the landfill in accordance with OSHA 29 CFR 1926.1101 (K)(2) and by 49 CFR Parts 171 and 172 of the Department of Transportation regulations.
- J. Provide any other signs, labels, warnings, and posted instructions that are necessary to protect, inform and warn people of the hazard from asbestos exposure. Post in a prominent and convenient place for the workers a copy of the latest applicable regulations from OSHA, EPA, NIOSH, State of New York and New York City and any additional items mandated for posting by the aforementioned regulations.
- K. Furnish all permits, variances and notices required to perform the Work.

### 1.08 EMERGENCY PRECAUTIONS

- A. Establish emergency and fire exits from the Work Area. The clean side of all emergency exits shall be equipped with two full sets of protective clothing and respirators at all times.
- B. Notify local medical emergency personnel, both ambulance crews and hospital emergency room staff prior to commencement of abatement operations as to the possibility of having to handle contaminated or injured workmen, and shall be advised on safe decontamination.
- C. Prepare to administer first aid to injured personnel after decontamination. Seriously injured personnel shall be treated immediately or evacuated immediately for decontamination. When an injury occurs, precautions shall be taken to reduce airborne fiber concentrations (i.e. misting of the air with water) until the injured person has been removed from the Work Area.
- D. Notify, before actual removal of the asbestos material, the local police and fire departments to the danger of entering the Work Area. Contractor shall make every

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effort to help these agencies form plans of action should their personnel need to enter the contaminated area.

### 1.09 SUBMITTALS

#### A. Pre-Construction Submittals

1. Attend a pre-construction meeting scheduled by the City of New York Department of Design and Construction. This meeting shall also be attended by a designated representative of the City of New York third party air monitoring firm, facility manager and the Construction Project Manager. At this meeting, the Contractor shall present three copies of the following items, bound and indexed. The detailed plan of action must be submitted at least five (5) days prior to the pre-construction meeting.
  - a. Contractor's scope of work, work plan and schedule.
  - b. Asbestos project notifications, approved variances and plans to Government Agencies.
  - c. Copies of Permits, clearance and licenses if required.
  - d. Schedules: the Contractor shall provide to the Construction Project Manager a copy of the following schedules for approval. Once approved, schedules shall be maintained and updated as received. Contractor shall post a copy of all schedules at the site:
    - (1) A construction schedule stating critical dates of the project including, but not limited to, mobilization, Work Area preparation, demolition, gross removal, fine cleaning, encapsulation, inspections, clearance monitoring, and phase of refinishing and final inspections. The schedule shall be updated biweekly, at a minimum.
    - (2) A schedule of staffing stating number of workers per shift per activity, name and number of supervisor(s) per shift, shifts per day, and total days to be worked.
    - (3) Submit all changes in schedule or staffing to the Construction Project Manager prior to implementation.
    - (4) A schedule of equipment to be used including numbers and types of all major equipment such as HEPA Air Filtration Units, HEPA-vacuums, airless sprayers, Water Atomizing Devices and Type "C" compressors.

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- e. A written plan and shop drawings for preparation of work site and decontamination chamber.
- f. Description of protective clothing and approved respirator to be used, make, model, NIOSH approval numbers.
- g. Delineation of responsibility of work site supervision, including competent person, with names, resumes, and home telephone numbers.
- h. Explanation of decontamination sequence and isolation techniques.
- i. Description of specific equipment to be utilized, including make and model number of air filtration devices, vacuums, sprayers, etc.
- j. Description of any prepared methods, procedures, techniques, or equipment other than those specified in the Contract Documents.
- k. Explanation of the handling of asbestos contaminated wastes including EPA and NYCDEP identification numbers of Waste Hauler.
- l. Description of the final clean-up procedures to be used.
- m. Name and qualifications of Contractor's Third-Party Air Monitor including AIHA accreditation, and proof of NIOSH PAT and NIST/NVLAP Bulk Quality Assurance Proficiency of OSHA samples for approval by the City of New York Department of Design and Construction.
- n. Written description of emergency procedures to be followed in case of injury or fire. This section must include evacuation procedures, source of medical assistance (name and telephone number) and procedures to be used for access by medical personnel (examples: first aid squad and physician). NOTE: Necessary Emergency Procedures Shall Take Priority Over All Other Requirements of These Specifications.
- o. Material Safety Data Sheets (MSDS) for encapsulants, sealants, firestopping foam, cleaners/disinfectants, spray adhesive and any and all potentially hazardous materials that may be employed on the project. No work involving the aforementioned will be allowed to proceed until MSDS are reviewed.
- p. Worker Training and Medical Surveillance: Contractor shall submit a list of the persons who will be employed by him and his Subcontractors in the removal work. Present evidence that workers

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have received proper training required by the regulations and the medical examinations required by OSHA 29 CFR 1926.1101.

q. Logs: Specimen copies of daily progress log, visitor's log, and disposal log.

(1) The Contractor shall provide a permanently bound log book of minimum 8-1/2" x 11" size at the entrance to the Worker and Waste Decontamination enclosure system as hereinafter specified. Log book shall contain on title page the project name, name, address and phone number of Environmental Control Representative; name, address and phone number of Abatement Contractor; name, address and phone number of Contractor and City's air testing entity; emergency numbers including, but not limited to local Fire/Rescue Department. Log book shall contain a list of personnel approved by the laboratory for entry into the Work Area.

(2) All entries into the log shall be made in non-washable, permanent ink and such pen shall be strung to or otherwise attached to the log to prevent removal from the log-in area. Under no circumstances shall pencil entries be permitted. Any significant events occurring during the abatement project shall be entered into the log. Upon completion of the job, the Contractor shall submit the logbook containing a day-to-day record of personnel log entries countersigned by the Construction Project Manager every day.

r. Worker's Acknowledgments: Submit statements signed by each employee that the employee has received training in the proper handling of ACM' understands the health implications and risks involved; and understands the use and limitations of the respiratory equipment to be used.

B. Submit copies of the following items to the Construction Project Manager during the work:

1. Security and safety logs showing names of person entering workspace, date and time of entry and exit, record of any accident, emergency evacuation, and any other safety and/or health incident.
2. Progress logs showing the number of workers, supervisors, hours of work and tasks completed shall be submitted daily to the Construction Project Manager.



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3. Floor plans indicating Contractor's current work progress shall be submitted for review by the Construction Project Manager at weekly progress meetings.
4. All Contractors' air monitoring and inspection results.

### C. Project Closeout Submittals

Upon completion of the project and as a condition of acceptance, the Contractor shall present two copies of the following items, bound and indexed:

1. Lien Waivers from Contractor, Sub-Contractors and Suppliers,
2. Daily OSHA air monitoring results,
3. All Waste Manifests (Asbestos and Construction Debris), seals and disposal logs.
4. Field Sign-In/Sign-Out Logs for every shift,
5. Copies of all Building Department Forms and Permits,
6. A Letter of Compliance stating that all the work on this project was performed in accordance with the Specifications and all applicable Federal, State and Local regulations,
7. All Warranties as stated in the Specifications,
  - a. Fully executed disposal certificates and transportation manifest.
8. Project Record: The contractor shall maintain a project record for all small and large asbestos projects. During the project, the project record shall be kept on site at all times. Upon completion of the project, the project record shall be maintained by the building owner. The project record shall be submitted to DDC as part of the close out documents. The project record shall consist of:
  - a. Copies of licenses of all contractors involved in the project;
  - b. Copies of DEP and NYSDOL supervisor and handler certificates for all workers engaged in the project;
  - c. Copies of all project notifications and reports filed with DEP and NYSDOL for the project, with any amendments or variances;
  - d. Copies of all asbestos abatement permits, including associated approved plans and work place safety plan;

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- e. A copy of the air sampling log and all air sampling results;
  - f. A copy of the abatement contractor's daily log book;
  - g. All data related to bulk sampling including the results of any asbestos surveys performed by an asbestos investigator;
  - h. Copies of all asbestos waste manifests;
  - i. A copy of all Project Monitor's Reports (ACP-15).
  - j. A copy of each ATR-1 Form completed for the asbestos project ( if required).
  - k. A copy of each Asbestos Project Conditional Closeout Report (ACP-20) .
  - l. A copy of the Asbestos Project Completion Form (ACP-21).
9. The Contractor shall submit one of the following certifications to the DOB, with a copy provided to DDC:
- a. Asbestos Project Completion Form. If an asbestos project has been performed, a copy of the asbestos project completion form issued by DEP shall be submitted to DOB, with a copy being provided to DDC, prior to the issuance of a DOB permit and to any amendment of the underlying construction document approval which increases the scope of the project to include (a) work area(s) not previously covered.
  - b. An Asbestos Project Conditional Close-out Form. If an asbestos project has been performed a copy of the asbestos project conditional close-out form issued by DEP shall be submitted to DOB, with a copy being provided to DDC, prior to the issuance of a DOB permit and to any amendment of the underlying construction document approval which increases the scope of the project to include (a) work area(s) not previously covered.

### 1.10 QUALITY ASSURANCE

- A. All work required for the completion of this project or called for in this Specification must be executed in a workmanlike manner by using the appropriate methods established by regulatory requirements and/or industrial standards. All workmanship or work methods are subject to review and acceptance by the Construction Project Manager. Throughout the Specification, reference is made to codes and standards which establish qualities, levels or types of workmanship which will be considered acceptable. It is the Abatement Contractor's

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responsibility to comply with these codes and standards during the execution of this work.

- B. All materials and equipment required or consumed during the work of this Contract must meet the minimum acceptable criteria established by codes and standards referenced elsewhere in this Specification. Materials and equipment must be submitted for prior approval as part of the Contractor's "Shop Drawings".
- C. It is the Abatement Contractor's responsibility, when so required by the Specification or upon written request from the Commissioner or his representative to furnish all required proof that workmanship, materials and/or equipment meet or exceed the codes and standards referenced. Such proof shall be in the form requested, typically a certified report or test conducted by a testing entity approved for that purpose by DDC.
- D. The Contractor shall furnish proof that employees working under his supervision have had instruction on the dangers of asbestos exposure, on respirator use, decontamination, and OSHA regulations. This proof shall be in the form of a notarized affidavit to the effect that the above requirements have been satisfied.
- E. The Contractor will have at all times in his possession and in view at the job site the OSHA regulations 29 CFR 1910.1001, and 1926.1101 Asbestos, and Environmental Protection Agency 40 CFR, Part 61, subpart B: National Emission Standard for asbestos, asbestos stripping, work practices and disposal of asbestos waste. He shall also have one copy of NYC Title 15, Chapter 1 of RCNY and NYS DOL ICR 56 at the job site at all times.
- F. Familiarity with Pertinent Codes and Standards: In procuring all items used in this work, it is the Contractor's responsibility to verify the detailed requirements of the specifically named codes and standards and to verify that the items procured for use in this work meet or exceed the specified requirements, and are suitable for their intended use.
- G. Rejection of Non Complying Items: The Commissioner reserves the right to reject items incorporated into the work that fail to meet the specified minimum requirements. The Commissioner further reserves the right, and without prejudice to other recourse that maybe taken, to accept non-complying items subject to an adjustment in the Contract amount as approved by the City.

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H. Applicable Regulations, Codes and Standards: Applicable standards listed in these Specifications include, but are not necessarily limited to, standards promulgated by the following agencies and organizations:

1. American National Standards Institute (ANSI)  
(Successor to USASI and ASA)  
25 West 43<sup>rd</sup> Street (between 5<sup>th</sup> and 6<sup>th</sup> Avenue) 4<sup>th</sup> Floor  
New York, NY 10036  
212-642-4900
2. American Society for Testing and Materials (ASTM)  
100 Bar Harbor Drive  
West Conshohocken, PA 19428-2959  
610-832-9500
3. National Institute for Occupational Safety and Health (NIOSH)  
Robert A. Taft Laboratory  
4676 Columbia Pkwy  
Mailstop R12 Cincinnati, Ohio 45226  
513-841-4428
4. National Electrical Code (NEC)  
See NFPA
5. National Fire Protection Association (NFPA)  
1 Batterymarch Park  
Quincy, Massachusetts 02169-7471  
617-770-3000
6. New York City Fire Department (FDNY)  
9 Metrotech Center  
Brooklyn, NY 11201-5431  
(718) 999-2117
7. New York City Department of Buildings (NYC DOB)  
Enforcement Division  
280 Broadway, New York, New York 10007  
212- 566-2850
8. New York City Department of Environmental Protection (NYCDEP)  
Bureau of Environmental Compliance  
Asbestos Control Program  
59-17 Junction Boulevard, 8<sup>th</sup> Floor  
Corona, New York 11368  
718-595-3682

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9. New York City Department of Health and Mental Hygiene (NYC DOHMH)  
Environmental Investigation  
125 Worth Street  
New York, New York 10013  
212-442-3372
  10. New York State Department of Labor (NYSDOL)  
Division of Safety and Health  
Engineering Services Unit  
State Office Building Campus  
Albany, New York 12240-0010
  11. New York City Department of Sanitation  
125 Worth Street, Room 714  
New York, New York 10013  
212-566-1066
  12. Occupational Safety and Health Administration (OSHA)  
Region II - Regional Office  
201 Varick Street, Room 908  
New York, New York 10014  
212-337-2378
  13. United States Environmental Protection Agency (EPA or USEPA)  
Region II  
Asbestos NESHAPS Contact  
Air and Waste Management Division  
(Air Compliance Branch) – USEPA  
290 Broadway, 21<sup>st</sup> Floor  
New York, New York 10007-1866  
212-637-3660
- I. Post all applicable regulations in a conspicuous place at the job site. Assure that the regulations are not altered, defaced or covered by other materials. One copy of each regulation must also be kept at the Contractor's office.

### 1.11 CITY/CONTRACTOR RESPONSIBILITIES

- A. The normal occupants of the Work Areas will be relocated by the City prior to the performance of the abatement work and returned there to at the conclusion of the abatement work, at no cost to the Contractor. However, the Contractor shall protect all furniture and equipment in the Work Areas in a manner as hereinafter specified. In addition, the Contractor shall perform the work of this Contract in a manner that will be least disruptive to the normal use of the non-Work Areas in the building.

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- B. Contractor shall be responsible for cleaning all portable items not specifically addressed by the Facility, in the Work Areas, or dispose of same as asbestos contaminated waste.
- C. Facility to provide Contractor with a list of items that cannot be removed and need special attention.
- D. Facility to stop all deliveries that may be scheduled to the Work Area while work is in progress.
- E. Facilities to have authorized personnel on site at all times or supply the Contractor with means of contacting such personnel without unreasonable delay. Such personnel shall have access to all areas, have knowledge of electrical, and air handling equipment. Such personnel shall assist the Contractor in case of any power failure or breakdown to shut down air supply systems, to reset and control all protective systems such as alarms, sprinklers, locks, etc. The Facility shall ensure no active air handling systems are operating within the Work Area.
- F. City will not occupy the portions of the building, in which work is being performed during the entire asbestos removal operation, including completion of clean up.
- G. Contractor shall provide a plan for 24 hours job security both for prevention of theft and for barring entry of curious but unprotected personnel into Work Areas.
- H. Contractor shall provide surveillance by a fire watch and set forth procedures to be taken for the safety of building occupants in the event of an emergency, in accordance with the WPSP.
- I. Should the failure of any utility occur, the City will not be responsible to the Contractor for loss of time or any other expense incurred.
- J. Facility will be responsible to notify the Contractor of any planned electrical power shutdowns in order to ensure that there are no power interruptions in the negative air pressure systems.
- K. Contractor shall remove all flammable materials from the work area and all sources of ignition (including but not limited to pilot lights) shall be extinguished.
- L. Contractor shall require a competent person (as defined in OSHA 1926.1101) to perform the following functions and to be on-site continuously for the duration of the project:
  - 1. Monitor the set up of the Work Area enclosure and ensure its integrity.
  - 2. Control entry and exit into the work enclosure.

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3. Ensure that employees are adequately trained in the use of engineering controls, proper work practices, proper personal protective equipment and in decontamination procedures.
4. Insure that employees use proper engineering controls, proper work practices, proper personal protective equipment and proper decontamination procedures.
5. The competent person (as defined in OSHA1926.1101) shall check for rips and tears in work suits, and ensure that they are mended immediately or replaced.

### 1.12 USE OF BUILDING FACILITIES

- A. City shall make available to the Contractor, from existing outlets and supplies, all reasonably required amounts of water and electric power at no charge.
- B. Electric power to all Work Areas shall be shut down and locked out except for electrical equipment that must remain in service. Safe temporary power and lighting shall be provided by Contractor in accordance with applicable codes. All power to Work Areas shall be brought in from outside the area through ground-fault interrupter circuits installed at the source. Stationary electrical equipment within the Work Area, which must remain in service, shall be adequately protected, enclosed and ventilated. The Facility will identify all electric lines that must remain in service. Contractor shall protect all lines.
- C. Contractor shall provide, at his own expense, all electrical, water, and waste connections, tie-ins, extensions, and construction materials, supplies, etc. All water tie-ins shall be hard piped with polyethylene or copper piping. At the end of each shift, Contractor shall disconnect all hoses within the work zone and place in equipment room of the worker decontamination unit. Contractor shall ensure positive shutoff of all water to Work Area during non-working hours.
- D. Utilities:
  1. General:

All temporary facilities required to be installed, shall be subject to the approval of the Commissioner. Prior to starting the work at any site; specify clearly the temporary locations of facilities preferably with sketches and submit the same to the Construction Project Manager for approval.
  2. Water:

The Department of Design and Construction will furnish all water needed for construction, at no cost to the Contractor in buildings under their jurisdiction. All temporary plumbing or adaptations to supply the needs of the Work Area shall be installed and removed by the Contractor and the cost thereof included in the Lump Sum price Bid for abatement work. Shower

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water for the decontamination unit shall be provided hot. Heating of water, if necessary, shall be provided by the Contractor.

3. Electricity:

The Department of Design and Construction will furnish all electricity needed for construction, at no cost to the Contractor in buildings under their jurisdiction. All temporary electrical work or adaptations to supply the needs of the Work Area shall be installed and removed by the Contractor and the cost thereof included in the Lump Sum price Bid for abatement work.

In leased spaces, arrangements for water supplies and electricity must be made with the landlord. However, all such arrangements must be made through and are subject to approval of the Department of Design and Construction. Utilities will be provided at no cost to the Contractor. However, it is the Contractor's (or the General Contractor's) responsibility to furnish and install a suitable distribution system to the Work Area. This system will be provided at no cost to the City.

A dedicated power supply for the negative pressure ventilating units shall be utilized. The negative air equipment shall be on a ground fault circuit interrupter (GFCI) protected circuit separate from the remainder of the work area temporary power circuits.

E. Contractor shall shut down and lock out all electric power to all work areas except for electrical equipment that must remain in service. Safe temporary power and lighting shall be provided in accordance with all applicable codes. Existing light sources (e.g. house lights) shall not be utilized. All power to work areas shall be brought in from outside the area through ground-fault circuit interrupter at the source.

1. If electrical circuits, machinery, and other electrical systems in or passing through the work area must stay in operation due to health and safety requirements, the following precautions must be taken:

- a. All unprotected cables, except low-voltage (less than 24 volts) communication and control system cables, panel boxes of cables and joints in live conduit that run through the work area shall be covered with three (3) independent layers of six (6) mil fire retardant polyethylene. Each layer shall be individually duct taped and sealed. All three (3) layers of polyethylene sheeting shall be left in place until satisfactory clearance air sampling results have been obtained.
- b. Any energized circuits remaining in the work area shall be posted with a minimum two (2) inch high lettering warning sign which reads: DANGER LIVE ELECTRICAL - KEEP CLEAR. A sign shall be placed on all live covered barriers at a maximum of ten (10) foot



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intervals. These signs shall be posted in sufficient numbers to warn all persons authorized to enter the work area of the existence of the energized circuits.

2. Any source of emergency lighting which is temporarily blocked as a result of work place preparation shall be replaced for the duration of the project by battery operated or temporary exit signs, exit lights, or photo luminescent path markings.
- F. Contractor shall provide a separate temporary electric panel board to power Contractor's equipment. The Facility will designate an existing electrical source in proximity to the Work Area. Contractor's licensed electrician shall provide temporary tie-in via cable, outlet boxes, junction boxes, receptacles and lights, all with ground fault interruption. At no time shall extension cords greater than 50-feet in length be allowed. All temporary electrical installation shall be in accordance with OSHA regulations. The electric shut down for power panel tie-in will be on off-hours and must be coordinated with the Facility. Contractor shall provide to the City a specification and drawing outlining his power requirements at the pre-construction meeting.
- G. Additional electrical equipment (i.e. transformers, etc.), which is necessary due to the lack of existing power on the floor, shall be at the Contractor's expense.
- H. Contractor shall provide fire protection in accordance with all State and Local fire codes.
- I. Sprinklers, standpipes, and other fire suppression systems shall remain in service and shall not be plasticized.
- J. When temporary service lines are no longer required, they shall be removed by the Contractor. Any parts of the permanent service lines, grounds and buildings, disturbed or damaged by the installation and/or removal of the temporary service lines, shall be restored to their original condition by the Contractor. Senior Stationary Engineer will inspect and test all switches, controls, gauges, etc. and shall submit a list to the Construction Project Manager of any equipment damaged by the Contractor.
- K. Contractor shall supply hot shower water necessary for use in the decontamination unit.

### 1.13 USE OF THE PREMISES

- A. Contractor shall confine his apparatus, the storage of materials, and supplies, and the operation of his workmen to limits established by law, ordinances, and the directions of the Construction Project Manager and the Facility. All flammable or combustible materials shall be properly stored to obviate fire and in areas approved by the Facility.

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- B. Contractor shall assure that no exits from the building are obstructed, that appropriate safety barriers are established to prevent access, and that Work Areas are kept neat, clean, and safe.
- C. Contractor shall maintain exits from the work area or alternative exits shall be established, in accordance with section 1027 of the New York City Fire Code. Exits shall be checked at the beginning and end of each work shift against blockage or impediments to exiting.
- D. If the openings of temporary structural partitions related to abatement work areas block egress, the partition shall consist of two sheets of fire retardant 6-mil plastic, prominently marked as an exit with photo luminescent paint or signage. Cutting tools (e.g., knife, razor) shall be attached to the work area side of the sheeting for use in the event that the barrier must be cut open to allow egress.
- E. All surrounding work, fixtures, soil lines, drains, water lines, gas pipes, electrical conduit, wires, utilities, duct work railings, shrubbery, landscaping, etc. which are to remain in place shall be carefully protected and, if disturbed or damaged, shall be repaired or replaced as directed by the City, at no additional cost.
- F. All routes through the building to be used by the Contractor shall first be approved by the Construction Project Manager and the Facility.
- G. Attention is specifically drawn to the fact that other Contractors, performing the work of other Contracts, may be (or are) brought upon any of the work sites of this Contract. Therefore, the Contractor shall not have exclusive rights to any site of his work and shall fully cooperate and coordinate his work with the work of other Contractors who may be on (or are on) any site of the work of this Contract. Regulated area exempted.
- H. Temporary toilet facilities must be provided by the Contractor on the site. Coordinate location of facilities with Construction Project Manager. No toilet facilities will be allowed in the Work Area.

### 1.14 PROTECTION AND DAMAGE

- A. The Contractor is responsible to cover all furniture and equipment that cannot be removed from Work Areas. Moveable furniture and equipment will be removed from Work Areas by Contractor prior to start of work and returned upon successful completion of the final air testing. At the conclusion of the work (after clearance level of air testing reaches the acceptable limit), the Contractor will remove all plastic covering from the walls, floors, furniture, equipment and reinstall furniture and equipment in the cleaned Work Area. The Contractor shall remove all shades, curtains and drapes from the Work Area, and reinstall the same following the final clean up.

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- B. Prior to plasticizing, the proposed work areas shall be pre-cleaned using HEPA filtered vacuum equipment and/or wet cleaning methods. Methods that raise dust, such as sweeping or vacuuming with equipment not equipped with HEPA filters, are prohibited.
- C. Use rubber tired vehicles that use non-volatile fuels for conveying material inside building and provide temporary covering, as necessary, to protect floors.
- D. No materials or debris shall be thrown from windows or doors of the building. Building waste system shall NOT be used to remove refuse.
- E. Debris shall be removed from the work site daily. Premises shall be left neat and clean after each work shift, so that work may proceed the next regular workday without interruption. Limited bag storage may take place within the Work Area when approved by the Construction Project Manager.
- F. Protect floors and walls along removal routes from damage, wear and staining with contamination control flooring. All finished surfaces to be protected with Masonite or other rigid sheathing material.
- G. A preliminary inspection for pre-existing damage shall be conducted by Contractor and representative of the City before commencement of the project.

### 1.15 RESPIRATORY PROTECTION REQUIREMENTS

- A. Respiratory protection shall be worn by all individuals who may be exposed to asbestos fibers from the initiation of the asbestos project until all areas have successfully passed clearance air monitoring in accordance with Regulations and these Specifications.
- B. Contractor shall develop and implement a written respiratory protection program with required site-specific procedures and elements. The program shall be administered by a properly trained individual. The written respiratory protection program shall include the requirements set forth in OSHA Standard 29 CFR 1910.134, at a minimum.
- C. The Contractor shall provide workers with individually issued and marked respiratory equipment. Respiratory equipment shall be suitable for the asbestos exposure level(s) in the Work Area(s), as specified in OSHA Standards 26 CFR 1910.134 and 29 CFR 1926.1101, NIOSH Standard 42 CFR 84, or as more stringently specified otherwise, herein.
- D. Where respirators with disposable filter parts are employed, the Contractor will provide sufficient filter parts for replacement as necessary or as required by the applicable regulation.

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- E. All respiratory protection shall be NIOSH approved. All respiratory protection shall be provided by Contractor, and used by workers in conjunction with the written respiratory protection program.
- F. Contractor shall provide respirators selected by an Industrial Hygienist that meet the following requirements:

Table 1. -- Assigned Protection Factors

Type of Respirator <sup>1, 2</sup>	Half mask	Full facepiece	Helmet/hood
1. Air-Purifying Respirator	<sup>3</sup> 10	50	.....
2. Powered Air-Purifying Respirator (PAPR)	50	1,000	<sup>4</sup> 25/1,000
3. Supplied-Air Respirator (SAR) or Airline Respirator			
• Demand mode	10	50	.....
• Continuous flow mode	50	1,000	<sup>4</sup> 25/1,000
• Pressure-demand or other positive-pressure mode	50	1,000	.....
4. Self-Contained Breathing Apparatus (SCBA)			
• Demand mode	10	50	50
• Pressure-demand or other positive-pressure mode (e.g., open/closed circuit)	.....	10,000	10,000

Notes:

<sup>1</sup>Employers may select respirators assigned for use in higher workplace concentrations of a hazardous substance for use at lower concentrations of that substance, or when required respirator use is independent of concentration.

<sup>2</sup>The assigned protection factors in Table 1 are only effective when the employer implements a continuing, effective respirator program as required by this section (29 CFR 1910.134), including training, fit testing, maintenance, and use requirements.

<sup>3</sup>This APF category includes filtering facepieces, and half masks with elastomeric facepieces.

<sup>4</sup>The employer must have evidence provided by the respirator manufacturer that testing of these respirators demonstrates performance at a level of protection of 1,000 or greater to receive an APF of 1,000. This level of performance can best be demonstrated by performing a WPF or SWPF study or equivalent testing. Absent such testing, all other PAPRs and SARs with helmets/hoods are to be treated as loose-fitting facepiece respirators, and receive an APF of 25.

<sup>5</sup>These APFs do not apply to respirators used solely for escape. For escape respirators used in association with specific substances covered by 29 CFR 1910 subpart Z, employers must refer to

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the appropriate substance-specific standards in that subpart. Escape respirators for other IDLH atmospheres are specified by 29 CFR 1910.134 (d)(2)(ii).

### G. Selection of high efficiency filters:

1. All high efficiency filters shall have a nominal efficiency rating of 100 (99.97-percent effective) when tested against 0.3-micrometer monodisperse diethyl-hexyl phthalate (DOP) particles.
2. Choose N-, R-, or P-series filters based upon the presence or absence of oil particles.
  - a. N-series filters shall only be used for non-oil solid and water based aerosols or fumes.
  - b. R- and P-series filters shall be used when oil aerosols or fumes (i.e., lubricants, cutting fluids, glycerin, etc.) are present. The R-series filters are oil resistant and the P-series filters are oil proof.
  - c. Follow filter manufacture recommendations.
3. If a vapor hazard exists, use an organic vapor cartridge in combination with the high efficiency filter.

### H. Historical airborne fiber level data may serve as the basis for selection of the level of respiratory protection to be used for an abatement task. Historical data provided by the Contractor shall be based on personal air monitoring performed during work operations closely resembling the processes, type of material, control methods, work practices, and environmental conditions present at the site. Documentation of aforementioned results may be requested by the City and/or Third-Party Air Monitor for review. This will not relieve the Contractor from providing personal air monitoring to determine the time-weighted average (TWA) for the work under contract. The TWA shall be determined in accordance with 29 CFR 1926.1101.

- I. At no time during actual removal operations shall half-mask air purifying respirators be allowed unless a full 8-hour TWA and excursion limit have been conducted, and reviewed by the Construction Project Manager. If the TWA and excursion limit have not been conducted, a Supplied-Air Respirator (SAR) or Airline Respirator or Self-Contained Breathing Apparatus (SCBA) must be used. Use of single use dust respirators is prohibited for the above respiratory protection.
- J. Workers shall be provided with personally issued and individually marked respirators. Respirators shall not be marked with any equipment that will alter the fit of the respirator in any way. Only waterproof identification markers shall be used.

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- K. Contractor shall ensure that the workers are qualitatively or quantitatively fit tested by an Industrial Hygienist initially and every 12 months thereafter with the type of respirator he/she will be using.
- L. Whenever the respirator design permits, workers shall perform the positive and negative air pressure fit test each time a respirator is worn. Powered air-purifying respirators shall be tested for adequate flow as specified by the manufacturer.
- M. No facial hairs (beards) shall be permitted to be worn when wearing respiratory protection that requires a mask-to-face seal.
- N. If a worker wears glasses, a spectacle kit to fit their respirator shall be provided by the Contractor at the Contractor's expense.
- O. Respiratory protection maintenance and decontamination procedures shall meet the following requirements:
  - 1. Respiratory protection shall be inspected and decontaminated on a daily basis in accordance with OSHA 29 CFR 1910.134 (b); and
  - 2. High efficiency filters for negative pressure respirators shall be changed after each shower; and
  - 3. Respiratory protection shall be the last piece of worker protection equipment to be removed. Workers must wear respirators in the shower when going through decontamination procedures as stated in Section 3.03 and/or 3.04.
  - 4. Airline respirators with high efficiency filtered disconnect shall be disconnected in the equipment room and worn into the shower. Powered air-purifying respirator face pieces shall be worn into the shower. Filtered/power pack assemblies shall be decontaminated in accordance with manufacturers recommendations; and
  - 5. Respirators shall be stored in a dry place and in such a manner that the face-piece and exhalation valves are not distorted; and
  - 6. Organic solvents shall not be used for washing of respirators.
- P. Authorized visitors shall be provided with suitable respirators and instruction on the proper use of respirators whenever entering the Work Area. Qualitative fit test shall be done to ensure proper fit of respirator.

### 1.16 PROTECTIVE CLOTHING

- A. Provide worker protection as required by the most stringent OSHA and/or EPA standards applicable to the work. Provide to all workers, foremen, superintendents, authorized visitors and inspectors, protective disposable clothing consisting of full

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body coveralls, head covers, gloves and 18-inch high boot type covers or reusable footwear.

- B. In addition to personal protective equipment for workers, the Contractor shall make available at each worksite at least four (4) additional uniforms and required respiratory equipment each day for personnel who are authorized to inspect the work site. He/she shall also provide, for the duration of the work at any site involving a decontamination unit for worksite access, a lockable storage locker for use by the Construction Project Manager. In addition to respiratory masks for workers, the Contractor must have on hand at the beginning of each work day, at least four (4) masks each with two sets of fresh filters, for use by personnel who are authorized to inspect the worksite. The Contractor shall check for proper fit of the respirators of all City personnel authorized to enter the Work Area.
- C. Asbestos handlers involved in tent procedures shall wear two (2) disposable suits, including gloves, hood and footwear, and appropriate respiratory equipment. All street clothes shall be removed and stored in a clean room within the work site. The double layer personal protective equipment shall be used for installation of the tent and throughout the procedure, if a decontamination unit (with shower and clean room) is contiguous to the Work Area, only one (1) layer of disposable personal protective equipment shall be required; in this case, prior to exiting the tent the worker shall HEPA vacuum and wet clean the disposable suit.
- D. The outer disposable suit (if 2 suits are worn) shall be removed and remain in the tent upon exiting. Following the tent disposal and work site clean up the workers shall immediately proceed to a shower at the work site. The inner disposal unit and respirator shall be removed in the shower after appropriate wetting. The disposal clothing shall be disposed of as asbestos-containing waste material. The workers shall then fully and vigorously shower with supplied liquid bath soap, shampoo, and clean dry towels.
- E. Coveralls: provide disposable full-body coveralls and disposable head covers. Require that they be worn by all workers in the Work Area. Provide a sufficient number for all required changes for all workers in the Work Area.
- F. Boots: provide work boots with non-skid soles, and where required by OSHA, foot protection, for all workers. Provide boots at no cost to workers. Paint uppers of all boots yellow with waterproof enamel. Do not allow boots to be removed from the Work Area for any reason after being contaminated with ACM and/or dust.
- G. Hard Hats: provide hard hats as required by OSHA for all workers, and provide a minimum of four spares for Inspectors, visitors, etc. Label all hats with same warning label as used on disposal bags. Require hard hats to be worn at all times that work is in progress that may cause potential head injury. Provide hard hats of the type with polyethylene strap suspension. Require hats to remain in the Work Area throughout the work. Thoroughly clean and decontaminate and bag hard hats prior to removing them from the Work Area at the end of the work.

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- H. Goggles: provide eye protection (goggles) as required by OSHA for all workers involved in any activity that may potentially cause eye injury. Require them to be worn at all times during these activities. Thoroughly clean and decontaminate goggles before removing them from the Work Area.
- I. Gloves: provide work gloves to all workers, of the type dictated by the Work and OSHA Standards. Do not remove gloves from the Work Area. Dispose of as asbestos-asbestos contaminated waste at the end of the work. Gloves shall be worn at all times, except during Work Area Preparation activities that do not disturb ACM.
- J. Reusable footwear, hard hats and eye protection devices shall be left in the contaminated Equipment Room until the end of the Asbestos Abatement Work.
- K. Disposable protective clothing shall be discarded and disposed of as asbestos waste every time the wearer exits from the workspace to the outside through the decontamination facility.
- L. Respirators, disposable coveralls, head covers and foot covers shall be provided by the Contractor for the Facilities Representative, Construction Project Manager and any other authorized representative who may inspect the Work Area. Provide two respirators and six respirator filter changes per day.

### 1.17 AIR MONITORING - CONTRACTOR

- A. Contractor shall employ a qualified industrial hygiene laboratory to analyze air samples in accordance with OSHA Regulations, 1926.1101 (Asbestos Standards for Construction) and New York City regulations. All costs for this work shall be included in the Bid Price.
- B. The industrial hygiene laboratory shall be a current proficient participant in the American Industrial Hygiene Association (AIHA) PAT Program. The laboratory identification number shall be submitted and approved by the City. The laboratory shall be accredited by the AIHA and New York State Department of Health Environmental Laboratory Approval Program (ELAP).
- C. Industrial hygiene laboratory shall also be a current proficient participant in the NIST/NVLAP Quality Assurance Program for the identification of bulk samples. Laboratory identification number shall be submitted to and approved by the City.
- D. Air monitoring responsibilities for the contractor's employees, shall be performed by a representative of the industrial hygiene laboratory retained by the Contractor.
- E. Contractor shall submit to the City all credentials of the designated (as defined in OSHA 1926.1101) and industrial hygiene laboratory representative for approval.



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- F. Air monitoring and inspection shall be conducted by the Contractor's competent person (as defined in OSHA 1926.1101).
- G. Continuous (daily or per shift) monitoring and inspection will include Work Area samples, personnel samples from the breathing zone of a worker to accurately determine the employees' 8-hour TWA (unless Type C respirators are used) and decontamination unit clean room samples.
- H. Work Area samples and employee personnel samples shall be taken using pumps whose flow rates can be determined to an accuracy of +5-percent, at a minimum of two liters per minute. This must be demonstrated at the job site.
- I. Sampling and analysis methods shall be per NIOSH 7400A.
- J. Test Reports:
  - 1. Promptly process and distribute one copy of the test results, to the Commissioner.
  - 2. Prompt reports are necessary so that if required, modifications to work methods and/or practices may be implemented as soon as possible.
  - 3. Contractor shall by facsimile notify the Commissioner within 24 hours of the results of each test, followed by written notification within three days.
- K. Competent person shall conduct inspections and provide written reports daily. Inspections will include checking the standard operating procedures, engineering control systems, respiratory protection and decontamination systems, packaging and disposal of asbestos waste, and any other aspects of the project which may affect the health and safety of the people and environment.
- L. All costs for required air monitoring by the Contractor's competent person shall be borne by the Contractor.
- M. The City reserves the right to conduct air and surface dust sampling in conjunction with and separate from the Third-Party Air Monitor for the purposes of Quality Assurance.
- N. All samples shall be accompanied by a Chain of Custody Record that shall be submitted to the Construction Project Manager upon completion of analysis.

### 1.18 THIRD PARTY MONITORING AND LABORATORY

- A. The NYCDDC, at its own expense, will employ the services of an independent Third Party Air Monitoring Firm and Laboratory. The Third Party Air Monitor will perform air sampling activities and project monitoring at the Work Site.

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- B. The Laboratory will perform analysis of air samples utilizing phase contrast microscopy (PCM) and/or transmission electron microscopy (TEM). This laboratory shall meet the standards stated in Paragraph 1.17. B.
- C. Observations will include, but not be limited to, checking the standard operating procedures, engineering control systems, respiratory protection, decontamination systems, packaging and disposal of asbestos waste, and any other aspects of the project that may affect the health and safety of the environment, Contractor, and/or facility occupants.
- D. The Third Party Air Monitoring Firm and the designated Project Monitor shall have access to all areas of the asbestos removal project at all times and shall continuously inspect and monitor the performance of the Contractor to verify that said performance complies with this Specification. The Third-Party Air Monitor shall be on site throughout the entire abatement operation.
- E. The NYCDDC will be responsible for costs incurred with the Third Party Air Monitoring Firm and laboratory work. Any subsequent additional testing required due to limits exceeded during initial testing shall be paid for by the Contractor.
- F. At a minimum, air sampling shall be conducted in accordance with the following schedule:

Abatement Activity	Pre-Abatement	During Abatement	Post-Abatement
Equal to or greater than 10,000 square feet or 10,000 linear feet of ACM	PCM	PCM	TEM
Less than 10,000 square feet or 10,000 linear feet of ACM	PCM	PCM	PCM

Note: TEM is acceptable wherever PCM is required.

- G. The number of air samples required per stage of abatement and size of abatement project is listed in the table below:

		Pre-Abatement	During Abatement	Post Abatement
<b>Large Asbestos Projects</b>				
1.	Full Containment	10	5	10
2.	Glovebag inside Tent	5 <sup>a</sup>	5 <sup>a</sup>	5 <sup>a</sup>
3.	Exterior Foam and Vertical Surfaces	-	5 <sup>c</sup>	5 <sup>d</sup>
4.	Interior Foam	10	5 <sup>c</sup>	10 <sup>d</sup>
<b>Small Asbestos Projects</b>				
1.	Full Containment	6	3	6

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2.	Glovebag inside Tent	3 <sup>b</sup>	3 <sup>b</sup>	3 <sup>b</sup>
3.	Tent	3 <sup>b</sup>	3 <sup>b</sup>	3 <sup>b</sup>
4.	Exterior Foam and Vertical Surfaces	-	3 <sup>c</sup>	3 <sup>d</sup>
5.	Interior Foam	6	3 <sup>c</sup>	6 <sup>d</sup>
	Minor Projects			
1.	Glovebag inside Tent	-	-	1 <sup>d</sup>
2.	Tent	-	-	1 <sup>d</sup>
3.	Exterior Foam and Vertical Surfaces	-	-	1 <sup>d</sup>
4.	Interior Foam	-	-	1 <sup>d</sup>

**Notes:**

- a. if more than three (3) tents then two (2) samples required per enclosure.
- b. if more than three (3) tents then one (1) sample required per enclosure.
- c. samples shall be taken within the work area(s).
- d. area sampling is required only if:
  - visible emissions are detected during the project
  - during-abatement area sampling results exceeded 0.01 f/cc or the pre-abatement area sampling result(s) for interior projects where applicable.
  - work area to be reoccupied is an interior space at a school, healthcare, or daycare facility.

H. Prior to commencement of abatement activities, the Third Party Air Monitoring Firm will collect a minimum number of area samples inside each homogeneous work area.

1. Samples will be taken during normal occupancy activities and circumstances at the work site.
2. Samplers shall be located within the proposed work area and at all proposed isolation barrier locations.
3. Samples shall be analyzed using PCM.
4. The number of samples to be collected will be determined by the size of the project and the abatement methods to be utilized.

I. Frequency and duration of the air sampling during abatement shall be representative of the actual conditions during the abatement. The size of the asbestos project will be a factor in the number of samples required to monitor the abatement activities. The following minimum schedule of samples shall be required daily.

1. For large asbestos projects employing full containment, area air sampling shall be performed at the following locations:

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- a. Two area samples outside the work area in uncontaminated areas of the building, remote from the decontamination facilities.
    - (1) Primary location selection shall be within 10 feet of isolation barriers.
    - (2) Where negative ventilation exhaust runs through uncontaminated building areas, one of the area samples will be required in these areas to monitor any potential fiber release.
    - (3) Where exhaust tubes have been grouped together in banks of up to five (5) tubes, with each tube exhausting separately and the bank of tubes terminating together at the same controlled area, one area air sample shall be taken.
  - b. One area sample within the uncontaminated entrance to each decontamination enclosure system.
  - c. Where adjacent non-work areas do not exist, an exterior area sample shall be taken.
  - d. One area sample within 5 feet of the unobstructed exhaust from a negative pressure ventilation system exhausting indoors but not within a duct.
  - e. One area sample outside, but within 25 feet of, the building or structure, if the entire building or structure is the work area.
2. For large asbestos projects involving interior foam method, area air sampling shall be performed at the following sampling locations:
- a. One area sample taken outside the work area within 10 feet of isolation barriers.
  - b. One area sample taken within the uncontaminated entrance to each worker decontamination and waste decontamination enclosure system.
  - c. One area sample within 5 feet of the unobstructed exhaust from a negative pressure ventilation system exhausting indoors but not within a duct, if applicable.
  - d. Three area samples inside the work area.
  - e. One area sample where the negative ventilation exhaust ducting runs through uncontaminated building areas, if applicable.

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3. For large asbestos projects employing the glovebag procedure within a tent, a minimum of five continuous air samples shall be taken concurrently with the abatement for each work area, unless there are more than three enclosures, in which case two area samples per enclosure are required.
  - a. Four area samples taken outside the work area within ten feet of tent enclosure(s).
  - b. One area sample taken within the uncontaminated entrance to each worker and waste decontamination enclosure system.
  - c. One area sample within five feet of the unobstructed exhaust from a negative pressure ventilation system exhausting indoors, but not within a duct, if applicable.
  - d. One area sample where negative ventilation exhaust ducting runs through uncontaminated building areas, if applicable.
4. For large asbestos projects involving exterior foam method or removal of ACM from vertical surfaces, a minimum of five continuous area samples shall be taken concurrently with the abatement for each work area using the following minimum requirements:
  - a. Three area samples inside the work area and remote from the decontamination systems.
  - b. One area sample within the uncontaminated entrance to each worker and waste decontamination enclosure system.
  - c. One area sample outside the work area within 25 feet of the building or structure, if the entire building or structure is the work area.
  - d. One area sample inside the building or structure at the egress point to the work area, if applicable.
5. For small asbestos projects employing full containment, a minimum of three continuous area samples shall be taken concurrently with the abatement for each work area at the following locations:
  - a. Two area samples taken outside the work area within ten feet of the isolation barriers.
  - b. One area sample within the uncontaminated entrance to each worker or waste decontamination enclosure system.
  - c. One area sample within five feet of the unobstructed exhaust from a

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negative pressure ventilation system exhausting indoors, but not within a duct, if applicable.

- d. One area sample where negative ventilation exhaust ducting runs through an uncontaminated building area, if applicable.
6. Tent Procedures:  
For projects involving more than 25 linear feet or 10 square feet, a minimum of three continuous samples shall be taken concurrently throughout abatement.
- J. Post-abatement clearance air monitoring for projects not solely employing glove-bag procedures shall include a minimum number of area samples inside each homogeneous work area and outside each homogeneous work area (five samples inside/5 samples outside for Large Projects and three samples inside/three samples outside for Small Projects). In addition to the five sample inside/five sample outside minimum for Large Projects, one additional representative area sample shall be collected inside and outside the work area for every 5,000 square feet above 25,000 square feet of floor space where ACM has been abated.
- K. Post-abatement clearance air monitoring for Small Projects solely employing glove-bag procedures is not required unless one or more of the following events occurs. In such cases, post-abatement clearance air monitoring procedures shall be followed. The events requiring post-abatement clearance air monitoring are:
  1. The integrity of the glove-bag was compromised,
  2. Visible emissions are detected outside the glove-bag, and/or
  3. Ambient levels exceed 0.01 f/cc during abatement.
- L. Monitoring requirements for other than post-abatement clearance air monitoring are as follows:
  1. The sampling zone for indoor air samples shall be representative of the building occupants' breathing zone.
  2. If possible, outdoor ambient and baseline samplers should be placed about 6 feet above the ground surface in reasonable proximity to the building and away from obstructions and drafts that may unduly affect airflow.
  3. For outdoor samples, if access to electricity and concerns about security dictate a rooftop site, locations near vents and other structures on the roof that would unduly affect airflow shall be avoided.
  4. Air sampling equipment shall not be placed in corners of rooms or near obstructions such as furniture.

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5. Samples shall have a chain of custody record.
- M. Area air sampling during abatement shall be conducted as specified in the following documents except as restricted or modified herein:
1. Measuring Airborne Asbestos Following an Abatement Action, US EPA document 600/4-85-049 (Nov., 1985);
  2. Guidance for Controlling Asbestos-Containing Materials in Buildings; US EPA Publication 560/5-85- 024 (June, 1984);
  3. Methodology for the Measurement of Airborne Asbestos by Electron Microscopy US EPA Contract No. 68-02- 3266;
  4. Mandatory and non-mandatory Electron Microscopy Methods set forth in 40 CFR Part 763, Subpart E, Appendix A.
  5. NIOSH 7400 method using "A" counting rules
- N. In accordance with the above criteria, area samples (see NYCDEP Asbestos Control Program Regulations) shall conform to the following schedule:

Area Samples for Analysis by	Minimum Volume	Flow Rate
PCM, 25mm cassettes	560 liters	5 to 15 liters/minute
TEM, 25mm cassettes	560 liters	1 to 10 liters/minute
TEM, 37mm cassettes	1,250 liters	1 to 10 liters/minute

- O. Post-abatement clearance air monitoring requirements are as follows:
1. Sampling shall not begin until at least one hour after wet cleaning has been completed and no visible pools of water or condensation remain.
  2. Samplers shall be placed at random around the work area. If the work area contains the number of rooms equivalent to the number of required samples based on floor area, a sampler shall be placed in each room. When the number of rooms is greater than the required number of samples, a representative sample of rooms shall be selected.
  3. The representative samplers placed outside the work area but within the building shall be located to avoid any air that might escape through the isolation barriers and shall be approximately 50 feet from the entrance to the work area, and 25 feet from the isolation barriers.
- P. The following aggressive sampling procedures shall be used within the work area during all clearance air monitoring:

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1. Before starting the sampling pumps, use forced air equipment (such as a one horsepower leaf blower) to direct exhaust air against all walls, ceilings, floors, ledges and other surfaces in the work area. This pre-sampling procedure shall take at least five minutes per 1,000 square feet of floor area; then
2. Place a 20-inch diameter fan in the center of the room. (Use one fan per 10,000 cubic feet of room space.) Place the fan on slow speed and point it toward the ceiling.
3. Start the sampling pumps and sample for the required time or volume.
4. Turn off the pump and then the fan(s) when sampling is completed.
5. Collect a minimum number of area samples inside and outside each homogeneous work area (5 inside / 5 outside samples for Large Projects and 3 inside / 3 outside samples for Small Projects). In addition to the minimum for Large Projects, one representative area samples shall be collected inside and outside the work area for every 5,000 square feet above 25,000 square feet of floor space where ACM has been abated.

Q. For post-abatement monitoring, area samples shall conform to the following schedule:

Area Samples for Analysis by	Minimum Volume	Flow Rate
PCM	1,800 liters	5 to 15 liters/minute
TEM	1,250 liters	1 to 10 liters/minute

1. Each homogeneous work area that does not meet the clearance criteria shall be thoroughly re-cleaned using wet methods, with the negative pressure ventilation system in operation. New samples shall be collected in the work area as described above. The process shall be repeated until the work site meets the clearance criteria.
2. For an asbestos project with more than one homogeneous work area, the release criterion shall be applied independently to each work area.
3. Should airborne fiber concentrations exceed the clearance criteria, the Contractor shall re-clean the work area utilizing wet wiping and HEPA-vacuuming techniques. Following completion of re-cleaning activities, the Third-Party Air Monitor will perform an observation of the Work Area. If the Third-Party Air Monitor determines that the work was performed in accordance with the specifications, the appropriate settling period will be observed and additional air sampling will be performed.



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4. All costs resulting from additional air tests and observations shall be borne by the Contractor. These costs may include, but are not limited to, labor, analysis fees, materials, and expenses.
5. After the area has been found to be in compliance, the Contractor may remove Isolation Barriers and perform final cleaning as specified.

### **R. Clearance and/or Re-occupancy Criteria**

1. The clearance criteria shall be applied to each homogeneous work area independently.
2. For PCM analysis, the clearance air monitoring shall be considered satisfactory when each of the 5 inside/5 outside samples for Large Projects and/or 3 inside/3 outside samples for Small Projects is less than or equal to 0.01 f/cc or the background concentrations, whichever is greater.
3. For TEM analysis, the clearance air monitoring shall be considered satisfactory when the requirements stated in 40 CFR Part 763, Subpart E, Appendix A, Section IV are met.
4. As soon as the air monitoring tests are completed, the Third-Party Air Monitor will send the results of such tests to the City and notify the Contractor.
5. The Contractor shall cooperate fully with all aspects of air monitoring operations.

### **1.19 TAMPERING WITH TEST EQUIPMENT**

All parties to this Contract are hereby notified that any tampering with testing equipment will be considered an attempt at falsifying reports and records to federal and state agencies and each offense will be prosecuted under applicable state and federal criminal codes to the fullest extent possible.

### **1.20 GUARANTEE**

- A. Work performed in compliance with this Contract shall be guaranteed for a period of one year from the date the completed work is accepted by the City.
- B. The Contractor shall not be held liable for the guarantee where the repair required under the guarantee is a result of obvious abuse or vandalism, as determined by the Commissioner.
- C. The City will notify the Contractor in writing regarding defects in work under the guarantee.

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### PART 2 – PRODUCTS

#### 2.01 MATERIAL HANDLING

- A. Deliver all materials to the job site in their manufacturer's original container, with the manufacturer's label intact and legible.
  - 1. Maintain packaged materials with seals unbroken and labels intact until time of use.
  - 2. Store all materials on pallets, away from any damp and/or wet surface. Cover materials in order to prevent damage and/or contamination.
  - 3. Promptly remove damaged materials and unsuitable items from the job site, and promptly replace with material meeting the specified requirements, at no additional cost to the City.
- B. The Construction Project Manager may reject as non-complying such material and products that do not bear identification satisfactory to the Construction Project Manager as to manufacturer, grade, quality and other pertinent information.

#### 2.02 MATERIALS

- A. Wetting agents: (Surfactant) shall consist of resin materials in a water base, which have been tested to ensure materials are non-toxic and non-hazardous. Surfactants shall be installed according to the manufacturer's written instructions.
- B. Encapsulants: Liquid material which can be applied to asbestos-containing material which temporarily controls the possible release of asbestos fibers from the material or surface either by creating a membrane over the surface (bridging encapsulant) or by penetrating into the material and binding its components together (penetrating encapsulant). A thin coat of lockdown encapsulant shall be applied to all surfaces in the work area which were not the subject of removal or abatement, including the cleaned layer of the surface barriers, but excepting sprinklers, standpipes, and other active elements of the fire suppression system.
- C. During abatement activities, replacement materials shall be stored outside the work area in a manner to prevent contamination. Materials required for the asbestos project (i.e. plastic sheeting, replacement filters, duct tape, etc.) shall be stored to prevent damage or contamination.
- D. Framing Materials and Doors: As required to construct temporary decontamination facilities and isolation barriers. Lumber shall be high grade, new, finished one side and fire retardant.
- E. Fire Retardant Polyethylene Sheeting: minimum uniform thickness of 6-mil. Provide largest size possible to minimize seams. All materials used in the

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construction of temporary enclosures shall be noncombustible or fire-retardant in accordance with NFPA 701 and 255.

- F. Fire Retardant Reinforced Polyethylene Sheeting: For covering floor of decontamination units, provide translucent, nylon reinforced or woven polyethylene laminated, fire retardant polyethylene sheeting. Provide largest size possible to minimize seams, minimum uniform thickness 6-mil. All materials used in the construction of temporary enclosures shall be noncombustible or fire-retardant in accordance with NFPA 701 and 255.
- G. Drums: Asbestos-transporting drums, sealable and clearly marked with warning labels as required by OSHA and EPA.
- H. Polyethylene Disposal Bags: Asbestos disposal bags, minimum of fire retardant 6-mil thick. Bags shall be clearly marked with warning labels as required by OSHA and EPA.
- I. Signs: Asbestos warning signs for posting at perimeter of Work Area, as required by OSHA and EPA.
- J. Waste Container Bag Liners and Flexible Trailer Trays: One piece leak-resistant flexible tray with absorbent pad.
- K. Tape: Provide tape which is of high quality with an adhesive that is formulated to aggressively stick to sheet polyethylene.
- L. Spray Adhesive: Provide spray adhesive in aerosol cans which is specifically formulated to stick tenaciously to sheet polyethylene.
- M. Flexible Duct: Spiral reinforced flex duct for air filtration devices.
- N. Protective Clothing: Workers shall be provided with sufficient sets of properly fitting, full-body, disposable coveralls, head covers, gloves, and 18-inch high boot-type foot covers. Protective clothing shall conform to OSHA Standard 29 CFR 1926.1101.
- O. Surfactants, strippers, sealers, or any other chemicals used shall be non-carcinogenic and non-toxic.
- P. Materials used in the construction of temporary enclosures shall be noncombustible or fire-retardant in accordance with NFPA 701 and 255.

### 2.03 TOOLS AND EQUIPMENT

- A. Air Filtration Device (AFD): AFDs shall be equipped with High Efficiency Particulate Air (HEPA) filtration systems and shall be approved by and listed with Underwriter's Laboratory.

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- B. Scaffolding: All scaffolding shall be designed and constructed in accordance with OSHA (29 CFR 1926/1910), New York City Building Code, and any other applicable federal, state and local government regulations. Whenever there is a conflict or overlap of the above references the most stringent provisions are applicable. All scaffolding and components shall be capable of supporting without failure a minimum of four times the maximum intended load, plus an allowance for impact. All scaffolding and staging must be certified in writing by a Professional Engineer licensed to practice in the State of New York.
1. Equip rungs of all metal ladders, etc., with an abrasive, non-slip surface.
  2. Provide non-skid surface on all scaffold surfaces subject to foot traffic. Scaffold ends and joints shall be sealed with tape to prevent penetration of asbestos fibers.
- C. Transportation Equipment: Transportation Equipment, as required, shall be suitable for loading, temporary storage, transit and unloading of asbestos contaminated waste without exposure to persons or property. Any temporary storage containers positioned outside the building for temporary storage shall be metal, closed and locked.
- D. Vacuum Equipment: All vacuum equipment utilized in the Work Area shall utilize HEPA filtration systems.
- E. Vacuum Attachments: Soft Brush Attachment, Asbestos Scraper Tool, Drill Dust Control Kit.
- F. Electric Sprayer: An electric airless sprayer suitable for application of encapsulating material and shall be approved by and listed with Underwriters Laboratory.
- G. Water Sprayer: The water sprayer shall be an airless or other low-pressure sprayer for amended water application.
- H. Water Atomizer: Powered air-misting device equipped with a ground fault interrupter and equipped to operate continuously.
- I. Brushes: All brushes shall have nylon bristles. Wire brushes are excluded from use due to their potential to shred asbestos fibers into small, fine fibers. Wire brushes maybe used for cleaning pipe joints within glove-bags upon written approval of the Construction Project Manager.
- J. Power tools used to drill, cut into, or otherwise disturb ACM shall be manufacturer-equipped with HEPA filtered local exhaust ventilation. Abrasive removal methods, including the use of beadblasters, are prohibited.

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- K. Other Tools and Equipment: Contractor shall provide other suitable tools for the stripping, removal, encapsulation, and disposal activities including but not limited to: hand-held scrapers, sponges, rounded-edge shovels, brooms, and carts.
- L. Fans and Leaf Blower: Provide Leaf Blower (one leaf blower per floor) and one 20-inch diameter fans for each 10,000 cubic feet of Work Area volume to be used for aggressive sampling technique for clearance air testing.
- M. Fire Extinguishers: At least one fire extinguisher with a minimum rating 2-A:10-B:C shall be required for each work place. In the case of large asbestos projects, at least two such fire extinguishers shall be required.
- N. First Aid Kits: Contractor shall maintain adequately stocked first aid kits in the clean rooms of the decontamination units and within Work Areas. The first aid kit shall be approved by a licensed physician for the work to be performed under this Contract.
- O. Water Service:
  - 1. Temporary Water Service Connection: All connections to the Facilities water system shall include back flow protection. Valves shall be temperature and pressure rated for operation of the temperature and pressures encountered. After completion of use, connections and fittings shall be removed without damage or alteration to existing water piping, and equipment. Leaking or dripping fittings/valves shall be repaired and or replaced as required.
  - 2. Water Hoses: Employ new heavy-duty abrasion-resistant hoses with a pressure rating greater than the maximum pressure of the water distribution system to provide water into each Work Area and to each Decontamination Enclosure Unit. Provide fittings as required for connection to existing wall hydrants or spouts, as well as temporary water heating equipment, branch piping, showers shut-off nozzles and equipment.
  - 3. Water Heater: Provide UL rated 40-gallon electric water heaters to supply hot water for Personal Decontamination Enclosure System Shower. Activate from 30 Amp Circuit breakers located within the Decontamination Enclosure sub panel. Provide relief valve compatible with water heater operations, pipe relief valve down to drip pan at floor level with type 'L' copper piping. Drip pans shall be 6-inch deep and securely fastened to water heater. Wiring of the water heater shall comply with NEMA, NECA, and UL standards.
- P. Electrical Service:
  - 1. General: Comply with applicable NEMA, NECA and UL standards and governing regulations for materials and layout of temporary electric service.

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2. **Temporary Power:** Provide service to decontamination unit sub panel with minimum 60 AMP, two pole circuit breaker or fused disconnect connected to the building's main distribution panel. Sub panel and disconnect shall be sized and equipped to accommodate all electrical equipment required for completion of the work.
3. **Voltage Differences:** Provide identification warning signs at power outlets that are other than 110-120 volt power. Provide polarized outlets for plug-in type outlets, to prevent insertion of 110-120 volt plugs into higher voltage outlets. Dry type transformers shall be provided where required to provide voltages necessary for work operations.
4. **Ground Fault Protection:** Equip all circuits for any purpose entering Work Area with ground fault circuit interrupters (GFCI). Locate the GFCIs outside the Work Area so that all circuits are protected prior to entry to Work Area. Provide circuit breaker type ground fault circuit interrupters (GFCI) equipped with test button and reset switch for all circuits to be used for any purpose in Work Area, decontamination units, exterior, or as otherwise required by NEC, OSHA or other authority.
5. **Power Distribution System:** Provide circuits of adequate size and proper characteristics for each use. In general run wiring overhead, and rise vertically where wiring will be least subject to damage from operations.
6. **Temporary Wiring:** In the Work Area shall be type UF non-metallic sheathed cable located overhead and exposed for surveillance. Provide liquid tight enclosures or boxes for all wiring devices. Do not wire temporary lighting with plain, exposed (insulated) electrical conductors.
7. **Electrical Power Cords:** Use only grounded extension cords; use hard service cords where exposed to traffic and abrasion. Use single lengths of cords only.
8. **Temporary Lighting:** All lighting within the Work Area shall be liquid and moisture proof and designed for the use intended.
  - a. Provide sufficient temporary lighting to ensure proper workmanship everywhere; by combined use of daylight, general lighting, and portable plug-in task lighting.
  - b. Provide lighting in the Decontamination Unit as required to supply a minimum 50-foot candle light level.
9. If electrical circuits, machinery, and other electrical systems in or passing through the work area must stay in operation due to health and safety requirements, the following precautions must be taken:

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- a. All unprotected cables, except low-voltage (less than 24 volts) communication and control system cables, panel boxes of cables and joints in live conduit that run through the work area shall be covered with three (3) independent layers of six (6) mil fire retardant polyethylene. Each layer shall be individually duct taped and sealed. All three (3) layers of polyethylene sheeting shall be left in place until satisfactory clearance air sampling results have been obtained.

### 2.04 CLEANING

- A. Throughout the construction period, the Contractor shall maintain the building as described in this Section.

1. The Contractor shall prevent building areas other than the Work Area from becoming contaminated with asbestos-containing dust or debris. Should areas outside the Work Area become contaminated with asbestos-containing dust or debris as a consequence of the Contractor's work practices, the Contractor shall be responsible for cleaning these areas in accordance with the procedures appended in Title 15, Chapter 1 of RCNY and NYSDOL ICR56. All costs incurred in cleaning or otherwise decontaminating non-Work Areas and the contents thereof shall be borne by the Contractor at no additional cost to the City.
2. The Contractor shall provide to all personnel and laborers the required equipment and materials needed to maintain the specified standard of cleanliness.

#### B. General

1. Waste water from asbestos removal operations, including shower water, may be discharged into the public sewer system only after approved filtration is on operation to remove asbestos fibers.
2. Asbestos wastes shall be double bagged in six mil (.006") fire retardant polyethylene bags approved for ACM disposal and shall be properly labeled and handled before disposal.
3. All waste generated shall be bagged, wrapped or containerized immediately upon removal. The personal and waste decontamination enclosure systems and floor and scaffold surfaces shall be HEPA vacuumed and wet cleaned at the end of each work shift at a minimum.
4. The Contractor shall use corrugated cartons or drums for disposal of asbestos-containing waste having sharp edged components (e.g. nails, screws, metal lathe and tin sheeting) that may tear polyethylene bags and sheeting. The waste within the drums or cartons must be double bagged.

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5. The Contractor shall transport all bags of waste to disposal site in thirty gallon capacity metal or fiber drums with tight lids, or in locked steel dumpster.
6. Dumping of debris, waste or bagged waste will not be permitted.
7. The waste decontamination enclosure system shall be wet cleaned twice using wet cleaning methods upon completion of waste removal. When the worker decontamination enclosure shower room alternates as a waste container wash room, the shower room shall be washed immediately with cloths or mops saturated with a detergent solution prior to wet cleaning.
8. Excessive water accumulation or flooding in the work area shall require work to stop until the water is collected and disposed of properly.
9. ACM shall be collected utilizing rubber dust pans and rubber squeegees.
10. HEPA vacuums shall not be used on wet materials unless specifically designed for that purpose.
11. Metal shovels shall not be used within the work area.
12. Mastic solvent when used will be applied in moderation (e.g. by airless sprayer). Saturation of the concrete floor with mastic solvent must be avoided.
13. The Contractor shall retain all items in the storage area in an orderly arrangement allowing maximum access, not impeding traffic, and providing the required protection of all materials.
14. The Contractor shall not allow accumulation of scrap, debris, waste material, and other items not required for use in this work. When asbestos contaminated waste must be kept on the work site overnight or longer, it shall be double bagged and stored in accordance with New York City Department of Sanitation (NYCDOS) regulation Title 16 Chapter 8, and Federal, State and City laws.
15. At least twice a week (more if necessary), the Contractor shall completely remove all scrap, debris and waste material from the job site.
16. The Contractor shall provide adequate storage space for all items awaiting removal from the job site, observing all requirements for fire protection and concerns for the environment.
17. All respiratory protection equipment shall be selected from the latest NIOSH Certified Equipment list.



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18. Daily and more often, if necessary, the Contractor shall inspect the Work Areas and adjoining spaces, and pick up all scrap, debris, and waste material. All such items shall be removed to the place designated for their storage.
19. Weekly, and more often, if necessary, the Contractor shall inspect all arrangements of materials stored on the site; re-stack and tidy them or otherwise service them to meet the requirements of these Specifications.
20. The Contractor shall maintain the site in a neat and orderly condition at all times.

### PART 3 – EXECUTION

#### 3.01 WORKER DECONTAMINATION FACILITY

##### A. Large Asbestos Projects (Small Project Option):

1. Provide a worker decontamination facility in accordance with, Title 15, Chapter 1, OSHA Standard 29 CFR 1926.1101, 12NYCRR Part 56 and as specified herein. Unless approved by NYCDEP and the City, worker decontamination facilities shall be attached to the Work Areas
  - a. Structure:
    - (1) Use modular systems or build using wood or metal frame studs, joists, and rafters placed at a maximum of 16 inches on-center.
    - (2) When worker decontamination unit is located outdoors, in areas with public access, or in correctional facilities, frame work shall be lined with minimum 3/8" thickness fire rated plywood sheathing. Sheathing shall be caulked or taped airtight at all joints and seams.
    - (3) Interior shall be covered with two layers of fire retardant 6-mil polyethylene sheeting, with a minimum overlap of 12 inches at seams. Seal seams airtight using tape and adhesive. The interior floor shall be covered with two (2) layers of reinforced fire-retardant polyethylene sheeting with a minimum overlap on the walls of twelve inches.
    - (4) Entrances to the decontamination unit shall be secured with lockable hinged doors. Doors shall be open at all times when abatement operations are in progress. Doors shall be louvered

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to allow for air movement through the decontamination units into Work Area.

- b. **Curtained Doorways:** A device to allow ingress or egress from one room to another while permitting minimal air movement between the rooms.
- c. **Air Locks:** Air locks shall consist of two curtained doorways placed a minimum of three feet apart.
- d. **Decontamination Enclosure System** shall be placed adjacent to the Work Area and shall consist of three totally enclosed chambers, separated from Work Area and each other by airlocks, as follows:
  - (1) **Equipment Room:** The equipment room shall have a curtain doorway to separate it from the Work Area, and share a common airlock with the shower room. The equipment room shall be large enough to accommodate at least one worker (allowing them enough room to remove their protective clothing and footwear), and a fire retardant 6-mil disposal bag for collection of discarded clothing and equipment. The equipment room shall be utilized for the storage of equipment and tools after decontamination using a HEPA-vacuum and/or wet cleaning. A one-day supply of replacement filters, in sealed containers, for HEPA-vacuums and negative air machines, extra tools, containers of surfactant, and other materials and equipment required for the project shall be stored here. A walk-off pan filled with water shall be placed in the Work Area just outside the equipment room for persons to clean foot coverings when leaving the Work Area. Contaminated footwear and reusable work clothing shall be stored in this room.
  - (2) **Shower Room:** The shower room shall have two airlocks (one that separates it from the equipment room and one that separates it from the clean room). The shower room shall contain at least one shower, with hot and cold water adjustable at the tap, per six workers. Careful attention shall be given to the shower to ensure against leaking of any kind and shall contain a rigid catch basin at least six inches deep. Contractor shall supply towels, shampoo and liquid soap in the shower room at all times. Shower water shall be continuously drained, collected, and filtered through a system with at least a 5-micron particle size collection capacity. A system containing a series of several filters with progressively smaller pore sizes shall be used to avoid rapid clogging of the filters by large particles. Pumps shall be installed, maintained and utilized in

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accordance with manufacturer's recommendations. Filtered water shall be discharged in accordance with applicable codes. Contaminated filters shall be disposed of as asbestos waste.

- (3) Clean Room: The clean room shall share a common airlock with the shower room and shall have a curtained doorway to separate it from outside non-contaminated areas. Lockers, for storage of workers' street clothing, and shelves, for storing respirators, shall be provided in this area. Clean disposable clothing, replacement filters for respirators, and clean dry towels shall be provided in the clean room. The clean room shall not be used for the storage of tool, equipment or other materials.

### B. Small Asbestos Projects

1. Provide a worker decontamination facility in accordance with, Title 15, Chapter 1, OSHA Standard 29 CFR 1926.1101, 12NYCRR Part 56 and as specified herein. Unless approved by NYCDEP and the City, worker decontamination facilities shall be attached to the Work Areas.
2. The worker decontamination enclosure system shall consist of, as a minimum, an equipment room, a shower room, and a clean room separated from each other and from the work area by curtained doorways. The equipment storage, personnel gross decontamination and removal of disposal clothing shall occur in the equipment room prior to entering the shower. All other requirements shall be the same as described above for a large asbestos project.
3. For small asbestos projects with only one exit from the work area, the shower room may be used as a waste washroom. The clean room shall not be used for waste storage. All other requirements shall be the same as described above for a large asbestos project.

- C. Decontamination Enclosure System Utilities: Lighting, heat, and electricity shall be provided as necessary by the Contractor, and as specified herein.

## 3.02 WASTE DECONTAMINATION FACILITY

### A. Large Asbestos Project (Small Project Option)

1. Provide a worker decontamination facility in accordance with, Title 15, Chapter 1, OSHA Standard 29 CFR 1926.1101, 12NYCRR Part 56 and as specified herein. Unless approved by NYCDEP and the City, worker decontamination facilities shall be attached to the Work Areas

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### a. Structure:

- (1) Use modular systems or build using wood or metal frame studs, joists, and rafters placed at a maximum of 16 inches on-center.
- (2) When worker decontamination unit is located outdoors, in areas with public access, or in correctional facilities, frame work shall be lined with minimum 3/8" thickness fire rated plywood sheathing. Sheathing shall be caulked or taped airtight at all joints and seams.
- (3) Interior walls shall be covered with two layers of fire retardant 6-mil polyethylene sheeting, with a minimum overlap of 12 inches at seams. Seal seams airtight using tape and adhesive. The interior floor shall be covered with two (2) layers of reinforced fire-retardant polyethylene sheeting with a minimum overlap on the walls of twelve inches.
- (4) Entrances to the decontamination unit shall be secured with lockable hinged doors. Doors shall be open at all times when abatement operations are in progress. Doors shall be louvered to allow for air movement through the decontamination units into the Work Area.

b. Curtained Doorways: A device to allow ingress or egress from one room to another while permitting minimal air movement between the rooms.

c. Air Locks: Air locks shall consist of two curtained doorways placed a minimum of three feet apart.

d. Decontamination Enclosure System shall be located outside the work area and attached to all locations through which ACM waste will be removed from the work area and shall consist of two totally enclosed chambers, separated from the Work Area and each other by airlocks, as follows:

- (1) Washroom: An equipment washroom shall have two air locks (one separating the unit from the Work Area and one common air lock that separates it from the holding area. The washroom shall have facilities for washing material containers and equipment. Gross removal of dust and debris from contaminated material containers and equipment shall be accomplished in the Work Area, prior to moving to the washroom.

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- (2) Holding Area: A holding area shall share a common air lock with the equipment washroom and shall have a curtained doorway to outside areas. A hinged, lockable door shall be placed at the holding area entrance to prevent unauthorized access into the Work Area.

### B. Small Asbestos Project

1. The worker decontamination enclosure system shall consist of, as a minimum, an equipment room, a shower room, and a clean room separated from each other and from the work area by curtained doorways. The equipment storage, personnel gross decontamination and removal of disposal clothing shall occur in the equipment room prior to entering the shower. All other requirements shall be the same as described above for a large asbestos project.
2. For small asbestos projects with only one exit from the work area, the shower room may be used as a waste washroom. The clean room shall not be used for waste storage. All other requirements shall be the same as described above for a large asbestos project.

- C. Decontamination Enclosure System Utilities: Lighting, heat, and electricity shall be provided as necessary by the Contractor, and as specified herein.

### 3.03 PERSONNEL ENTRANCE AND DECONTAMINATION PROCEDURES FOR REMOVAL OPERATIONS UTILIZING REMOTE DECONTAMINATION FACILITIES

- A. All individuals who enter the Work Area shall sign the entry log, located in the clean room, upon each entry and exit. The log shall be permanently bound and shall fully identify the facility, agents, contractor(s), the project, each Work Area, and worker respiratory protection employed. The job supervisor shall be responsible for the maintenance of the log during the abatement activity. The log shall be submitted to the NYC DDC within 48 hours of request.
- B. Each worker shall remove street clothes in the clean room; wear two disposable suits, including gloves, hoods and non-skid footwear; and put on a clean respirator (with new filters) before entering the Work Area.
- C. Each worker shall, before leaving the Work Area or tent, clean the outside of the respirators and outer layer of protective clothing by wet cleaning and/or HEPA-vacuuming. The outer disposable suit shall be removed in the airlock prior to proceeding to the Worker Decontamination Unit. The inner disposable suit and respirator shall be wet wiped and HEPA vacuumed thoroughly before removing and prior to aggressive shower.

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- D. Following showering and drying off, each worker or authorized visitor shall proceed directly to the clean room, dress in street clothes, and exit the decontamination enclosure system immediately.

### **3.04 PERSONNEL ENTRANCE AND DECONTAMINATION PROCEDURES FOR REMOVAL OPERATIONS UTILIZING ATTACHED DECONTAMINATION FACILITIES**

- A. All workers and authorized visitors shall enter the Work Area through the worker decontamination facility.
- B. All individuals who enter the Work Area shall sign the entry log, located in the clean room, upon each entry and exit. The log shall be permanently bound and shall identify fully the facility, agents, contractor(s), the project, each Work Area and worker respiratory protection employed. The site supervisor shall be responsible for the maintenance of the log during the abatement activity. The log shall be submitted to the NYC DDC within 48 hours of request.
- C. Each worker or authorized visitor shall, upon entering the job site, remove street clothes in the clean room and put on a clean respirator with filters, and clean protective clothing before entering the Work Area through the shower room and equipment room.
- D. Each worker or authorized visitor shall, each time he leaves the Work Area, remove gross contamination from clothing before leaving the Work Area; proceed to the equipment room and remove clothing except the respirator; still wearing the respirator, proceed to the shower room; clean the outside of the respirator with soap and water while showering; remove filters, wet them, and dispose of them in the container provided for that purpose; wash and rinse the inside of the respirator; and thoroughly shampoo and wash himself/herself.
- E. Following showering and drying off, each worker or authorized visitor shall proceed directly to the clean room, dress in street clothes, and exit the decontamination enclosure system immediately. Disposable clothing of the type worn inside the Work Area is not permitted outside the Work Area.

### **3.05 MAINTENANCE OF DECONTAMINATION ENCLOSURE FACILITIES AND BARRIERS**

The following procedures shall be followed during abatement activities.

- A. All polyethylene barriers inside the work place and partitions constructed to isolate the Work Area from occupied areas shall be inspected by the asbestos handler supervisor at least twice per shift.
- B. Smoke tubes shall be used to test the integrity of the Work Area barriers and the decontamination enclosure systems daily before abatement activity begins and at

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the end of each shift.

- C. Damage and defects in the decontamination enclosure system shall be repaired immediately upon discovery. The decontamination enclosure system shall be maintained in a clean and sanitary condition at all times.
- D. At any time during the abatement activity, if visible emissions are observed, or elevated asbestos fiber counts outside the Work Area are measured, or if damage occurs to barriers, abatement shall stop. The source of the contamination shall be located, the integrity of the barriers shall be restored and extended to include the contaminated area, and visible residue shall be cleaned up using appropriate HEPA-vacuuming and wet cleaning.
- E. Inspections and observations shall be documented in the daily project log by the asbestos handler supervisor.
- F. The daily inspection to ensure that exits have been checked against exterior blockage or impediments to exiting shall be documented in the log book. If exits are found to be blocked, abatement activities shall stop until the blockage is cleared.

### 3.06 MODIFICATIONS TO HVAC SYSTEMS

- A. Shut down, isolate or seal, all existing HVAC units, fans, exhaust fans, perimeter convection air units, supply and/or return air ducts, etc., situated in, traversing or servicing the work zone.
- B. Seal all seams with duct tap. Wrap entire duct with a minimum of two layers of fire retardant 6-mil polyethylene sheeting. All shutdowns are to be coordinated with the Facility. Where systems must be maintained, i.e. traversing Work Areas to non-Work Areas, only supply ducts will be maintained, protect as described above. All returns must be blanked off in Work Area and adjacent areas, including floor above and below Work Area. When required Contractor shall apply for a clarification from NYCDEP. The Contractor shall implement the following engineering procedures:
  - 1. Maintenance of a positive pressure within the HVAC system of 0.01 inch water gauge (or greater) with respect to the ambient pressure outside the Work Area. The conditions for this system shall be maintained and be operational 24 hours per day from the initiation of Work Area preparation until successful final air clearance. Positive pressurization of HVAC system shall be applied only under the direction and control of professional engineer, or other knowledgeable licensed professional;
  - 2. The positive pressurization of the duct shall be tested, inspected and recorded both at the beginning and at the end of each shift;

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3. The positive pressurization shall be monitored using instrumentation which will provide a written record of pressurization and that will trigger an audible alarm, if the static pressure falls below the set value;
  4. The supply air fan and the supply air damper for the active positive-pressurized duct shall be placed in the manual "on" positions to prevent shutdown by fail-safe mechanisms;
  5. The return air fan and the return air dampers shall be shut down and locked-out;
  6. All the seams of the HVAC ducts that pass through the Work Area shall be sealed;
  7. The HVAC ducts that pass through the Work Area shall be covered with two (2) layers of fire retardant 6-mil polyethylene sheeting, and all seams and edges of both layers shall be sealed airtight;
  8. The supply air fans, return air fans, and all dampers servicing the Work Area itself shall be shut down and locked-out. All openings within the Work Area of supply and return air ducts shall be sealed with 3/8-inch fire rated plywood and two layers of fire retardant 6-mil polyethylene;
  9. When abatement occurs during periods while the HVAC system is shut down so that an alternative method of pressurization of the duct passing through the Work Area is used (e.g., by low-pressure "blowers", etc., directly coupled into the duct). Item #4 above shall be deleted and shall be replaced by the requirement to set the dampers of the HVAC duct in the manual closed positions, in order to effect pressurization.
- C. Contractor to coordinate this item with the Facility and Construction Project Manager at the commencement of work.  
Where present HVAC systems (ducts) service an area and that air system cannot be shut down, Contractor shall isolate and seal the ducts, both supply and return, at the boundary of that zone.
1. To isolate, cap, or seal a duct, the Contractor shall remove insulation from duct (if necessary), then disconnect linkage to fold shut all fire dampers. Contractor shall seal all edges and seams with caulk and duct-tape.
  2. Contractor shall then cut existing duct and fold metal in and secure with approved fasteners. Contractor shall caulk and duct-tape all seams and edges.
  3. All ducts shall then be completely wrapped and sealed with duct-tape and three (3) layers of reinforced polyethylene sheeting.



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4. All ducts shall be restored to original working order at the end of the project.
- D. Where present HVAC systems (ducts) service occupied areas (non-Work Areas), the Contractor shall blank off the ducts.
1. To isolate or seal the return duct, the Contractor shall remove any insulation (if necessary) from the duct. Then disconnect linkage to fold shut all fire dampers and insert a fiberglass board within the duct. Contractor shall seal all edges and seams with caulk, duct-tape and three (3) layers of reinforced polyethylene sheeting.
  2. All isolation of return ducts and any other activity that requires removal of ceiling by the Contractor shall be conducted under controls. Work is to be coordinated with the Construction Project Manager and the Facility and is described as follows:
    - a. Work shall occur as scheduled.
    - b. Horizontal surfaces near the blanking operations shall be protected with fire retardant 6-mil polyethylene sheeting.
    - c. Plastic drapes shall be used to enclose the immediate area.
    - d. Contractor to position and operate air filtration devices and HEPA-vacuums in the area to clean space after blanking operations.
    - e. All personnel involved with this work shall receive personal protection (i.e. respirators and disposable suits).
- E. Upon loss of negative pressure or electric power, all work activities in an area shall cease immediately and shall not resume until negative pressure and/or electric power has been fully restored. When a power failure or loss of negative pressure lasts, or is expected to last, longer than thirty (30) minutes, the following sequence of events shall occur.
1. All make up air inlets shall be sealed airtight.
  2. All decontamination facilities shall be sealed airtight after evacuation of all personnel from the Work Area.
  3. All adjacent areas shall be monitored for potential fiber release upon discovery of and subsequently throughout, power failure.

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### 3.07 LOCKOUT OF HVAC SYSTEMS, ELECTRIC POWER, AND ACTIVE BOILERS

Prior to the start of any prep work, the Contractor shall employ skilled tradesmen with limited asbestos licenses for the following work:

- A. Disable all ventilating systems or other systems bringing air into or exhausting air out of the Work Area. Disable system by disconnecting wires removing circuit breakers, by lockable switch or other positive means to ensure against accidental re-starting of equipment.
- B. Lockout power to the Work Area by switching off all breakers and removing them from panels or by switching and locking entire panel. Label panel with following notation: "DANGER CIRCUIT BEING WORKED ON". Give all keys to Facility.
- C. Lock out power to circuits running through Work Area whenever possible by switching off and removing breakers from panel. If circuits must remain live, the Facility shall notify Contractor in order that he may secure a variance from NYCDEP. The Contractor shall protect all conduit and wires to remain and label all active circuits at intervals not to exceed 3 feet with tags having the following notation: "DANGER LIVE ELECTROCUTION HAZARD". The Contractor shall label all circuits in all locations including hidden locations that may be affected by the work in a similar manner.
- D. All boilers and other equipment within the work area shall be shut down, locked out, tagged out and the burner/boiler/equipment accesses and openings shall be sealed until abatement activities are complete. If the boiler or other exhausted equipment will be subject to abatement, all breeching, stacks, columns, flues, shafts, and double-walled enclosures serving as exhausts or vents shall be segregated from the affected boiler or equipment and sealed airtight to eliminate potential chimney effects within the work area.

## PART 4 – PREPARATION OF WORK AREA AND REMOVAL PROCEDURES

### 4.01 REMOVAL OF ASBESTOS-CONTAINING MATERIAL

#### A. Contractor Responsibility

Contractor shall be responsible for the proper removal of ACM from the Work Area using standard industry techniques. The Third-Party Air Monitor representative shall observe the Work.

#### 1. General Requirements

- a. Removal of ACM shall be performed using wet methods. Dry removal of ACM is prohibited.

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- b. Spray ACM with amended water with sufficient frequency and quantity to enhance penetration. Sufficient time shall be allowed for amended water to penetrate the material to the substrate prior to removal. All ACM shall be thoroughly wetted while work is being conducted.
- c. Accumulation of standing water on the floor of the Work Area is prohibited.
- d. Apply removal encapsulants, when used, in accordance with the manufacturer's recommendations and guidelines.
- e. Containerize ACM immediately upon detachment from the substrate. Alternately, ACM may be dropped in to a flexible catch basin and promptly bagged. Detached ACM is not permitted to lie on the floor for any period of time. Excess air within the bag shall be removed before sealing. ACM shall not be dropped from a height of greater than 10 feet. Above 10 feet, dust free inclined chutes may be used. Maximum inclination from horizontal shall be 60-degrees for all chutes
- f. Exits from the work area shall be maintained, or alternative exits shall be established, in accordance with section 1027 of the New York City Fire Code. Exits shall be checked at the beginning and end of each work shift against blockage or impediments to exiting.
- g. Signs clearly indicating the direction of exits shall be maintained and prominently displayed within the work area.
- h. No smoking signs shall be maintained and prominently displayed within the work place.
- i. At least one fire extinguisher with a minimum rating 2-A:10-B:C shall be required for each work place. In the case of large asbestos projects, at least two such fire extinguishers shall be required.
- j. If the containment area of an asbestos project covers the entire floor of the affected building, or an area greater than 15,000 square feet on any given floor, the installation of a negative air cut off switch or switches shall be required at a single location outside the work place, such as inside a stairwell, or at a secured location in the ground floor lobby when conditions warrant. The required switch or switches shall be installed by a licensed electrician pursuant to a permit issued by the Department of Buildings. If negative pressure ventilation equipment is used on multiple floors the cut off switch shall be able to turn off the equipment on all floors.

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### B. Removal of ACM Utilizing Full Containment Procedures shall be as follows:

#### 1. Preparation Procedures:

- a. Ensure that the Third-Party Air Monitor has performed area monitoring and established a background count prior to the preparatory operations for each removal area, as applicable.
- b. Shut down, isolate, and lock out or tag heating, ventilating, and air conditioning (HVAC) systems which serve or which pass through the Work Area. Vents within the Work Area and seams in HVAC components shall be sealed with tape and two layers of fire retardant polyethylene sheeting. Filters in HVAC systems shall be removed and treated as asbestos-asbestos contaminated waste.
- c. Shut down, disconnect, and lock out or tag all electric power to the Work Area so that there is no possibility of its reactivation until after clearance testing of the Work Area.
- d. Provide and install decontamination enclosure systems in accordance with Sections 3.01 and 3.02 of this Section.
- e. Remove ACM that may be disturbed by the erection of partitions using tent procedures and wet removal methods. Removal shall be limited to a one-foot wide strip running the length/height of the partition.
- f. Pre-clean and remove moveable objects from the Work Area. Pre-cleaning shall be accomplished using HEPA-vacuum and wet-cleaning techniques. Store moveable objects at a location determined by the City.
- g. Protect carpeting that will remain in the Work Area.
  - (1) Pre-clean carpeting utilizing wet-cleaning techniques.
  - (2) Install a minimum of two layers of fire retardant 6-mil reinforced polyethylene sheeting over carpeting.
  - (3) Place a rigid flooring material, minimum thickness of 3/8-inch, over polyethylene sheeting.
- h. Pre-clean all fixed objects to remain within the Work Area using HEPA-vacuum and wet-cleaning techniques.
- i. Seal fixed objects with two individual layers, minimum, of 6-mil fire retardant polyethylene sheeting.

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- j. Pre-clean entire Work Area utilizing HEPA-vacuum and wet-cleaning techniques. Methods of cleaning that raise dust; such as dry sweeping or use of vacuum equipment not equipped with HEPA-filters, is prohibited.
- k. Install isolation barriers (i.e., sealing of all openings, including but not limited to windows, corridors, doorways, skylights, ducts, grills, diffusers, and other penetrations within the Work Area) using two layers of 6-mil fire retardant polyethylene sheeting and duct-tape.
- l. Construct rigid framework to support Work Area barriers.
  - (1) Framework shall be constructed using 2-inch by 4-inch wooden or metal studs placed 16 inch on center when existing walls and/or ceiling do not exist for all openings greater than 32 square feet. Framework is not required except where one dimension is one foot or less or the opening will be used as an emergency exit.
  - (2) Apply a solid construction material, minimum thickness of 3/8-inch to the Work Area side of the framing. In secure interior areas, not subject to access from the public or building occupants, an additional layer of 6-mil fire retardant polyethylene sheeting may be substituted for the rigid construction material.
  - (3) Caulk all wall, floor, ceiling, and fixture joints to form a leak tight seal.
- m. Seal floor drains, sumps, shower tubs, and other collection devices with two layers of 6-mil fire retardant plastic and fire rated plywood, as necessary, and provide a system to collect all water used by the Contractor. Collected water shall be passed through a water filtration system prior to being discharged into the sanitary sewer.
- n. Remove ceiling mounted objects not previously sealed that will interfere with removal operations. Mist object and surrounding ACM with amended water prior to removal to minimize fiber dispersal. Clean all moveable objects using HEPA-vacuum and wet-cleaning techniques prior to removal from the Work Area.
- o. Fiberglass insulation with intact coverings shall be protected in place during abatement activities. These materials shall be protected with two layers of 6-mil fire retardant polyethylene sheeting as isolation barriers and two additional layers of 6-mil fire retardant polyethylene sheeting serving as primary and secondary surface barriers.

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- p. Install and initiate operation of AFDs to provide a negative pressure and a minimum of four air changes per hour within the Work Area relative to surrounding non-Work Areas. Do not shut down AFDs until the Work Area is released to the City following final clearance procedures. The use of HEPA-filtered vacuum to produce a negative air pressure inside the enclosure is prohibited.
- q. Maintain emergency and fire exits from the Work Areas or establish alternative exits satisfactory to the local fire officials. Emergency exits and routes shall be established and clearly marked with fluorescent paint or other effective designations to permit easy location from anywhere within the Work Area. Cutting tools (e.g., knife, razor) shall be attached to the work area side of the sheeting for use in the event that the barrier must be cut open to allow egress. Emergency exits shall be secured to prevent access from uncontaminated areas and yet permit emergency exiting. Exits shall be checked daily against exterior blockage or impediments to exiting.
- r. Temporary lighting within the Work Area and decontamination system shall be provided as required to achieve minimum illumination levels.
- s. Hand power tools used to drill, cut into, or otherwise disturb ACM shall be manufacturer-equipped with HEPA filtered local exhaust ventilation.
- t. Prior to being plasticized, the Work Areas shall be cleaned using HEPA vacuum equipment and/or wet cleaning methods as appropriate. Methods that raise dust, such as dry sweeping or vacuuming with equipment not equipped with HEPA filters, shall not be used.
- u. Plasticize the area after pre-cleaning, using the following procedures.
  - (1) Cover floors with one layer of 6-mil fire retardant polyethylene sheeting, turning layer a minimum of 6 inches up wall, and seal layer to wall.
  - (2) Cover walls with one layer of 6-mil fire retardant polyethylene sheeting, overlapping wall layer a minimum of 6 inches, and seal layer to floor layer.
  - (3) Cover floors with a second layer of 6-mil fire retardant polyethylene sheeting, turning layer a minimum of 12 inches up wall, and seal layer to wall.

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- (4) Cover walls with a second layer of fire retardant 6-mil polyethylene sheeting, overlapping wall layer a minimum of 12 inches, and seal layer to floor layer.
  - (5) In areas where demolition is required to access ACM, a layer of fire retardant 6-mil reinforced polyethylene sheeting shall be placed on the floor of the enclosure.
  - (6) Perform demolition required to access ACM. Debris resulting from demolition activities shall be disposed of as ACM waste as described in this Specification.
  - (7) Repeat preparation of areas accessed by demolition activities as described above.
- v. Suspended ceiling tiles and T-grid components shall remain in place until the preparation of the Work Area below the ceiling tiles are completed and personnel and equipment decontamination enclosures have been constructed.
  - w. Scaffolds shall be provided for workers engaged in work that cannot safely be performed from the ground or other solid Work Area surface.
  - x. Means of egress shall not be obstructed by hardwall barriers.
  - y. Pre-Removal Inspections
    - (1) Prior to removal of any ACM, the Contractor shall notify the Third-Party Air Monitor and request a pre-removal inspection. Posting of warning signs, building of decontamination enclosure systems, and all other preparatory steps have been taken prior to notification of the Third-Party Air Monitor.
    - (2) Contractor shall correct any deficiencies observed by Third-Party Air Monitor at no additional cost to City.
    - (3) Following the Third-Party Air Monitor's approval of the Work Area preparations, removal of ACM may commence.
2. Removal of ACM Within Full Containment:
- a. Mist material with amended water. Allow sufficient time for the amended water to penetrate the material to be removed.

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- b. Remove the material using hand tools such as scrapers or putty knives. Wire-mesh or wood lathe reinforcing, when present, shall be cut into manageable pieces and disposed of as ACM.
  - c. Remove any residual material from the substrate using wet cleaning methods and nylon-bristled hand brushes.
  - d. Place the removal material immediately into a properly labeled fire retardant 6-mil polyethylene bag. All material shall be properly containerized and decontaminated prior to removal from the Work Area.
  - e. Following the completion of removal of insulation, all visible residue shall be removed from the substrate
3. Following Removal of ACM utilizing Full Containment Procedures:
- a. First Cleaning:
    - (1) Remove any visible accumulation of asbestos material and debris. HEPA-vacuuming and wet cleaning shall be performed on all surfaces inside the Work Area. All sealed drums, plastic bags, and equipment used in the Work Area shall be removed from the Work Area.
    - (2) Upon request of the Contractor, the Third-Party Air Monitor will perform a visual inspection. Evidence of asbestos contamination identified during the inspection will necessitate further cleaning as heretofore specified.
    - (3) Remove first layer of plastic sheathing inside the Work Area. The isolation barriers and decontamination facility shall remain in place and be utilized.
  - b. Second Cleaning:
    - (1) After the first cleaning, the Work Area shall be vacated for twelve hours to allow fibers to settle.
    - (2) All objects and surfaces in the Work Area shall be HEPA - vacuumed and wet cleaned for a second cleaning.
    - (3) A thin coat of lockdown encapsulant shall be applied to all plastic covered surfaces in the Work Area.



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- (4) When the encapsulant is dry, second layer of polyethylene sheeting on the walls, ceiling and floors shall be removed. Do not remove seals from doors, windows, Isolation Barriers or disconnect the negative pressure equipment.

### c. Third Cleaning:

- (1) A minimum of four hours after the second cleaning, all the surfaces in the Work Area shall be HEPA-vacuumed and wet cleaned for a third cleaning.
- (2) Upon the request of the Contractor, the Third-Party Air Monitor will do final visual inspection for re-occupancy. Evidence of asbestos contamination identified during the inspection will necessitate further cleaning as heretofore specified.
- (3) When the Work Area passes the Third-Party Air Monitor's visual re-occupancy inspection, air sampling shall not begin until at least one hour after the completion of the third cleaning. The Third-Party Air Monitor shall perform air monitoring using aggressive testing techniques. The Third-Party Air Monitor will approve re-occupancy if the specified fiber count in the Work Area is achieved according to the Third-Party Air Monitor.
- (4) When the Work Area passes the re-occupancy test, all controls and seals established shall be removed.
- (5) The cleaned layer of the surface barriers shall be removed from walls and floors.
- (6) The isolation barriers shall remain in place throughout cleanup. Decontamination enclosure systems shall remain in place and be utilized. A thin coat of lockdown encapsulant shall be applied to all surfaces in the work area which were not the subject of removal or abatement, including the cleaned layer of the surface barriers, but excepting sprinklers, standpipes, and other active elements of the fire suppression system.

### d. Final Barrier Removal

- (1) Upon receipt of acceptable clearance testing results, polyethylene sheeting and Isolation Barriers shall be removed and disposed accordingly as asbestos-containing material.

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(2) The area surrounding the abatement work place shall be cleaned of any visible debris utilizing HEPA vacuum and wet methods.

- e. The Third-Party Air Monitor will conduct a final visual observation. Approval must be granted prior to break down of decontamination facility and contractor demobilization.

C. Removal of ACM Roofing and Flashing Materials utilizing NYC DEP § 1-107  
Foam Procedure for Roof Removal shall be as follows:

1. Preparation procedures:

- a. These procedures apply only to the removal of asbestos-containing roofing material (ACRM) from exterior roof surfaces. The work area on the roof shall be cordoned off with clearly visible barriers such as caution tape, and only authorized persons shall have access.
- b. The foam or viscous liquid shall be non-toxic, shall not require special respiratory protection for handling, and shall not affect the handling and disposal of the waste.
- c. The foam or viscous liquid shall coat and maintain a stable blanket (minimum 1" thickness) for the duration of the removal process and shall leave an identifiable colored residue when it dissipates.
- d. The foam or viscous liquid shall wet the ACRM. The ACRM shall be kept wet through the bagging process.
- e. Persons entering the work area shall wear correctly-fitting, good traction rubber boots.
- f. Abatement shall not be carried out during adverse weather conditions (e.g. precipitation, high winds, ambient temperature below 32 degrees Fahrenheit, etc.).
- g. The worker decontamination unit may be attached to each work area at an entry/exit from each work area, or may be remote, in which case it shall be equipped with an airlock at the entrance. In addition to the shower head(s), the shower room shall be equipped with a flexible hose for waste decontamination for removal of less than 1,000 square feet of ACRM. For 1,000 square feet or more of ACRM removal, a separate waste decontamination facility shall be located at an entry/exit from each work area. Remote holding areas for the asbestos containing waste shall comply with Title 16, Chapter 8, Rules of the City of New York (16 RCNY 8 et seq.)

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- h. Movable objects shall be removed from the work area, or kept in place and wrapped in one sheet of fire retardant 6 mil plastic sheeting.
- i. Provisions shall be made to ensure a safe and adequate air supply to affected building(s). All vents, skylights, air intakes, windows and doors opening onto the roof, and all other openings shall be sealed with 2 layers of fire retardant 6 mil plastic or fitting with HEPA filters when appropriate. Temporary extensions may be installed to a height of 10 feet to ensure adequate air exchange instead of sealing vents, air intakes, etc, with 2 layers of plastic or HEPA filters. Drains may be equipped with 5 micron filtering system in lieu of being sealed.
- j. Fixed objects including perimeter walls, bulkheads, cooling towers, ducts and other rooftop appurtenances shall be covered in one sheet of fire retardant 6 mil plastic up to a height of at least six feet.
- k. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTION OF THE INTERIOR SPACES BENEATH THE ROOF.
- l. All office equipment and furniture, including but not limited to desks, chairs, computers, printers, cabinets, etc., carpeted and wooden floors shall be covered with one layer of 6- mil plastic sheeting.
- m. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE THAT MAY OCCUR IN THE INTERIOR SPACES, INCLUDING BUT NOT LIMITED TO OFFICE EQUIPMENT, FURNITURE, FLOORS, ETC., BENEATH THE ROOF DURING ALL PHASES OF THE ROOF ABATEMENT.
- n. The Contractor shall provide temporary roof protection consisting of 10-mil polyethylene sheeting following abatement over the open roof areas. Strict coordination with the General Contractor, Construction Project Manager and/or Architect is required and necessary during this phase of abatement.
- o. Preliminary examination shall be conducted and precautions shall be taken to prevent damage to the interior of the building, including but not limited to office equipment, furniture, carpeted and wooden floors, etc., and to ensure no adverse effect on the structural stability of the roof due to the abatement activity.
- p. Abatement activities shall not be carried out during adverse weather conditions (e.g., precipitation, heavy winds, etc.).

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- q. The floor area between the remote decontamination facility and the Work Area must be protected with 2 layers of 6-mil. polyethylene sheeting suitably anchored.
- r. Provisions shall be made to ensure a safe and adequate air supply to affected building(s). All vents, skylights, air intakes, windows and doors opening onto the roof, and all other openings are to be sealed with two layers of 6-mil plastic or fitted with HEPA-filters where appropriate. In lieu of sealing vents, air intakes, etc., with two layers of plastic or HEPA-filters, temporary extensions may be installed to a height of 10 feet to ensure adequate air exchange. Drains may be equipped with 5 micron filtering systems in lieu of being sealed.
- s. Pre-Removal Inspections:
  - (1) Prior to removal of any ACM, the Contractor shall notify the Third-Party Air Monitor and request a pre-removal inspection. Posting of warning signs, building of decontamination enclosure systems, and all other preparatory steps have been taken prior to notification of the Third-Party Air Monitor.
  - (2) Contractor shall correct any deficiencies observed by Third-Party Air Monitor at no additional cost to City.
  - (3) Following the Third-Party Air Monitor's approval of the Work Area preparations, removal of ACM may commence.

### 2. Removal of ACM Roofing and Flashing Materials:

- a. The Contractor shall be responsible for the removal of all roofing components, including multiple layers of built-up membrane, tar, vapor barrier and/or flashing down to the substrate/deck.
- b. Prior to actual removal, the built-up roofing shall be blanketed and wetted with a minimum 1" coating of the acceptable foam or viscous liquid which shall be maintained for the duration of the removal until the material is bagged. The foam or viscous liquid shall be confined to the work area.
- c. Hand-held power tools used to drill, cut into, or otherwise disturb the ACRM shall be equipped with the HEPA-filtered local exhaust ventilation and operated to prevent potential fiber release.
- d. Abatement shall not be performed in adverse weather conditions (e.g., precipitation, heavy winds, etc.) Contractor shall protect all exposed roof during adverse weather conditions.

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- e. Portable HEPA-vacuum machines shall be available during abatement.

After the ACM removal and bagging, the bagged waste shall be HEPA-vacuumed, and then wet-cleaned and transferred into the shower room for double bagging. The double-bagged waste shall be transferred outside the clean room for its final transfer for storage in an enclosed waste container.

### 3. Following Removal of ACM Roofing and/or Flashing:

- a. Upon completion of the abatement in roof work area, clean-up procedures shall involve removal and bagging of:
  - b. The asbestos containing roofing material (ACRM)
  - c. Visible accumulations of asbestos containing waste
  - d. All excess foam or similar viscous liquid
  - e. All debris, and shall be followed by a thorough wet cleaning.
  - f. All tools shall be wet cleaned and HEPA-vacuumed, and then removed from the work area upon completion.
  - g. Following the removal of all debris, the work area shall be thoroughly wet cleaned. The work area shall be allowed to dry completely before the visual inspection is conducted. The inspection shall confirm the absence in the work area of:
    - (1) ACM, debris, bagged ACM waste,
    - (2) Excess foam or other viscous liquid.
  - h. If the work area fails visual inspection, it shall undergo another wet cleaning and/or HEPA vacuuming until it passes the visual inspection.
  - i. When the visual inspection and clearance testing is successful, all plastic may be removed.
  - j. Air monitoring shall be conducted in accordance with the relevant provisions of Air sampling shall be conducted in compliance with NYC DEP Title 15 Chapter 1, §1-41 Air Sampling Schedule.

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### 4.02 MAINTENANCE OF CONTAINED WORK AREA AND DECONTAMINATION ENCLOSURE SYSTEMS

- A. Ensure that barriers are installed in a manner appropriate to the expected weather conditions during the project and for its duration. Repair damaged barriers and remedy defects immediately upon their discovery. Visually inspect barriers at the beginning and end of each work period.
- B. Visually inspect non-Work Areas and the decontamination enclosure system for water leakage. Check the floor below, ceiling and walls, and view beneath/or around the decontamination enclosure system, for signs of leakage. Perform the visual inspection a minimum of two times for each 8-hour work shift.

## PART 5 – ASBESTOS WASTE MANAGEMENT

### 5.01 ACM WASTE REQUIREMENTS

- A. The Contractor and all sub-Contractors are specifically alerted to the illegal practice of combining asbestos-containing waste (ACW) from one project with the ACW of other projects without using the services of a permitted waste transfer station as defined by 6 NYCRR Part 360 and 364. As part of the shop drawing submittals, the Contractor must submit for approval the proposed method of transportation and disposal that will be utilized to manage the ACW of this Contract. If a permitted transfer station is to be used, the cost shall be included in the Bid price. The Contractor must submit a waste manifest consistent with whatever approved method is utilized as part of the invoicing and payment procedures.
- B. The Contractor shall maintain compliance with the strictest set of regulations of Title 15, Chapter 1 of RCNY, NYC LL 70/85, NYS DOL ICR 56, USEPA, Asbestos Regulation 40 CFR Section 61.152, 29 CFR 1926.1101, 29 CFR 1910.1200 (F) of OSHA's Hazard Communication Standards, and other applicable standards.

**NOTE:** Any penalties incurred for failure to comply with any of the above regulations will be the sole responsibility for fines imposed due to negligence of the Contractor.

- C. When presenting ACW for storage at the generation site, the Contractor shall:
  - 1. Wet down ACW in a manner sufficient to prevent all visible emissions of dust into the air.
  - 2. Seal material in a leak tight container while wet.
  - 3. Keep ACW separate from any other waste.

## ASBESTOS ABATEMENT

D. When presenting ACW for storage away from the site of generation, the Contractor shall:

1. Ensure that ACW has been properly packaged as per requirements above.
2. Examine the containers of ACW to ensure that there are no breaks in the containers and that no visible dust is being released into the air.
3. If examination reveals damage to a container of ACW the Contractor or person accepting the waste shall immediately wet down the ACW and repackage it into a clean leak tight container. The subsequent repackaging shall be the financial responsibility of the Contractor and occur at no extra cost to the City.
4. Keep ACW separate from any other waste.

E. When storing ACW – The Contractor shall:

1. Ensure that the ACW has been sufficiently wetted down in tight containers.
2. Re-wet and repackage any damaged containers.
3. Maintain at storage site an adequate supply of spare leak tight containers.
4. Maintain at storage site an adequate supply of amended water.
5. Keep ACW separate from any other waste.
6. Keep ACW in a secured, enclosed, and locked container.
7. If the Contractor has intention of sorting a quantity of ACW greater than or equal to 50 cubic yards, the Contractor shall:
  - a. Submit a written request and receive written approval from the City.

F. When presenting for transport, the Contractor shall:

1. Ensure that ACW has been sufficiently wetted down.
2. Examine the integrity of the container's airtight seal.
3. Re-wet and repackage any damaged containers.
4. Keep ACW separate from all other waste.
5. Ensure that a person transporting asbestos waste holds a valid permit issued pursuant to law.

## ASBESTOS ABATEMENT

### 6. Frequency of Waste Removal:

- a. Properly packaged and labeled asbestos waste shall be removed from the site on a daily basis. Under no circumstance shall asbestos waste be stored on site without written approval from the City. The Waste Hauler and landfill shall be as indicated on the notifications to regulatory agencies.

G. **Waste Load-out Through Equipment Decontamination Enclosure (Full Decontamination Facility):** Place asbestos waste in disposal bags. Large items not able to fit into disposal bags shall be wrapped in one layer of 6-mil thick polyethylene sheeting. Clean outer covering of asbestos waste package by wet cleaning and/or HEPA-vacuuming in a designated part of the Work Area. Move wrapped asbestos waste to the equipment washroom, wet clean each bag or object and place it inside a second disposal bag, or a second layer of 6-mil polyethylene sheeting, as the item's physical characteristics demand. Air volume shall be minimized, and the bags or sheeting shall be sealed airtight with tape.

1. The clean containerized items shall be moved to the equipment decontamination enclosure holding area pending load-out to storage or disposal facilities.
2. Workers who have entered the equipment decontamination enclosure system from the uncontaminated non-Work Area shall perform load-out of containers from the decontamination enclosure holding area. Dress workers moving asbestos waste to storage or disposal facilities in clean overalls of a color different than from that of coveralls used in the Work Area. Ensure that workers do not enter from uncontaminated areas into the equipment washroom or the Work Area. Ensure that contaminated workers do not exit the Work Area through the equipment decontamination enclosure system.
3. Thoroughly clean the equipment decontamination enclosure system immediately upon completion of the waste load-out activities, and at the completion of each work shift.
4. Labeled ACM waste containers or bags shall not be used for non-ACM debris or trash. Any materials placed in labeled containers or bags, including those turned "inside-out", shall be handled and disposed of as ACM waste.

H. All asbestos materials, wastes, shower water, polyethylene, disposable equipment and supplies shall be disposed of as asbestos contaminated waste, in accordance with the EPA regulation (40 CFR, Section 61.150) and those requirements of the New York Department of Environmental Conservation and New York City Department of Sanitation.



## ASBESTOS ABATEMENT

- I. All asbestos materials shall be prepared for transportation in accordance with this specification and all applicable Federal, State, County and City Regulations. Contractor shall submit the following documentation:
  - 1. Where applicable, an EPA Generator's identification number which has been obtained from the EPA for all asbestos waste generated from the project. . .
  - 2. Applicable State Waste Hauler license and registration numbers.
  - 3. Federal Hazardous Materials Waste Hauler number.
  - 4. Designated landfill EPA Permit numbers.
- J. Prior to loading asbestos waste the enclosed cargo areas (dumpster) shall be prepared as follows:
  - 1. Clean via HEPA-vacuum and wet wipe techniques the enclosed cargo areas of all visible debris prior to preparing with polyethylene.
  - 2. Line the cargo area with two layers of 6-mil polyethylene sheeting to prevent contamination from damaged or leaking containers. Floor sheeting shall be installed first and extend up the walls a minimum of 24-inches. Wall sheeting shall be overlapped and taped securely into place.
- K. Asbestos-containing waste shall be placed on level surfaces in the cargo area of the dumpster and shall be packed tightly to prevent any shifting or tipping of the waste during transportation.
- L. Asbestos-containing waste shall not be thrown into or dropped from the dumpster. All material shall be handled carefully to prevent rupture of the containers.
- M. All personnel engaged in handling and loading of asbestos contaminated waste outside of the Work Area shall wear protective clothing. The disposable clothing shall include head, body and foot protection and color of clothing shall be different from abatement personnel in the Work Area. Minimum respiratory protection shall be half face, dual cartridge, air purifying respirators with HEPA-filters.
- N. Contractor shall immediately clean debris or residue observed on containers or surfaces outside of the Work Area. Cleaning shall be via HEPA equipped wet/dry vacuums only.
- O. All asbestos-containing waste shall be transported from the abatement site to the landfill by a registered Waste Hauler. When transporting ACW:
  - 1. Ensure that the ACW has been sufficiently wetted down in a leak tight container.

## ASBESTOS ABATEMENT

2. Re-wet and repackage any damaged containers.
  3. Maintain at storage site an adequate supply of spare leak tight containers.
  4. Maintain at storage site an adequate supply of amended water.
  5. Keep ACW separate from any other waste.
- P. Keep ACW in a secured, enclosed, and locked container.
- Q. Waste transport documents shall conform to the requirements of the U.S. Department of Transportation, Hazardous Materials Transportation Regulation, 49 CFR Part 173 and EPA 40 CFR 61.150 (d)(1)(2). Shipping documents shall be clearly marked with the required designation "RQ Asbestos". Contractor shall provide a copy of this document to the City.
- R. A uniform hazardous waste manifest shall be prepared by the Contractor and signed by the Contractor each time the Contractor ships a dumpster load of Asbestos-Containing Waste Material. The uniform hazardous waste manifest shall include the site of waste generation, the names and addresses of the Transporter, the Contractor, and the landfill operator with information on the type and number of asbestos-waste containers, time and date. Contractor shall provide the Construction Project Manager, Third-Party Air Monitor or authorized designated representative with signed copies of the waste manifest before each departure.
- S. Contractor or his registered hazardous Waste Hauler shall transport asbestos-containing waste material from the abatement site directly to the specified disposal site. Contractor or their Waste Hauler shall not accept material from any other site when transporting asbestos-containing waste material from the abatement site. The authorized DDC representative or Construction Project Manager reserves the right to travel with Contractor's Waste Hauler to the waste disposal site. No intermediate storage of waste material (i.e. Contractors warehouse) shall be permitted.
- T. Final or progress application for payments will not be processed unless all hazardous waste manifests generated to date have been received and reviewed by the Construction Project Manager.
- U. All asbestos materials, wastes, shower water, polyethylene disposable equipment and supplies shall be disposed of as asbestos contaminated waste, in accordance with the EPA regulation (40 CFR, Section 61.150) and those requirements of the New York State Department of Environmental Conservation and the New York Department of Sanitation.
- V. Contractor shall transport all sealed drums to a landfill disposal site approved by the Department of Environmental Conservation and the EPA. Transportation shall be performed by a New York State registered Waste Hauler, where required.

## ASBESTOS ABATEMENT

When presenting the ACW for disposal the Contractor or sub Contractor shall:

1. Ensure that waste container is properly labeled according to the National Emission Standard for Hazardous Air Pollutants (NESHAP); Asbestos Revision, 40 CFR, Part 61, Subpart M. The labels shall include the name of the waste generator and the location where the waste was generated.
  2. Comply with all applicable orders issued pursuant to asbestos disposal.
  3. Ensure that ACW has been sufficiently wetted down.
  4. Re-wet and repackage any damaged containers.
  5. Keep ACW separate from all other wastes.
- W. Contractor shall notify the waste disposal site, at least 24 hours prior to transportation of asbestos contaminated waste to be delivered. Contractor shall determine if a larger notification period is required.
- X. At the site Contractors or Waste Hauler trucks shall approach the dump location as close as possible for unloading asbestos waste. Containers shall be carefully placed in the ground. Do not throw containers from truck.
- Y. Contractor or Waste Hauler shall inspect containers as they are unloaded at the disposal site. Material in damaged containers shall be repacked in empty containers, as necessary.
- Z. Contractor or Waste Hauler shall not remove asbestos-containing waste Material from drums unless required to do so by the disposal site City. Used drums shall be disposed of as asbestos-asbestos contaminated waste.
- AA. All personnel engaged in unloading of the containers at the waste site shall wear protective clothing. The disposable clothing shall include head, body and foot protection. Minimum respiratory protection shall be half face, dual cartridge, air purifying respirators with HEPA-filters. Workers shall remove their protective clothing at the disposal site, place it in labeled disposal bags and leave them with the deposited waste shipment.
- BB. For the compaction operation, the Contractor shall ensure that disposal sites personnel have been provided with personal protective equipment by the disposal operator. If the disposal site City has not provided this protective equipment, the Contractor shall supply protective clothing and respiratory protection for the duration of this operation (PAPR respirators are mandatory).
- CC. If containers are broken or damaged, the Contractor or Waste Hauler shall, using personnel who are properly trained and wearing proper protective equipment, shall repackage the waste in properly labeled containers. Contractor shall then clean the

## ASBESTOS ABATEMENT

entire truck and its contents using HEPA-vacuums and wet cleaning techniques until no visible residue is observed.

- DD. Following the removal of all containerized waste, the Contractor shall decontaminate the truck cargo area using HEPA-vacuums and/or wet cleaning techniques until no residue is observed. All 6-mil polyethylene sheeting shall be removed and discarded as asbestos-containing waste material along with contaminated cleaning material and protective clothing, in containers at the disposal site.
- EE. The transporter(s) of all asbestos waste shall not back-haul any items on his return from landfill/disposal site.
- FF. All asbestos waste shall be disposed of in an approved Asbestos Landfill site only.
  - 1. NO PERSON UNDER ANY CIRCUMSTANCES SHALL ABANDON ACW. The same shall be disposed of only by certified persons in approved landfills.
  - 2. A manifest form will be signed by the Landfill documenting receipt and acceptance of the asbestos-containing waste. This manifest will be furnished to the City of New York within thirty calendar days from the project completion date.
  - 3. It is the responsibility of the Asbestos Contractor to determine current waste handling, transportation and disposal regulations for the work site and for each waste disposal landfill. The Asbestos Contractor must comply fully with these regulations and all appropriate U.S. Department of Transportation, EPA and other Federal, State and Local entities' regulations and all other current legal requirements.
  - 4. The Asbestos Contractor shall obtain an agreement from the transporter (s) that the practice of "Back-Hauling" will not be engaged in, with respect to any and all waste loads taken from this site during the work.
  - 5. The Asbestos Contractor will document actual disposal of the waste at the designated landfill by having completed a Disposal Certificate and will provide a copy of the same to the Department of Design and Construction.

## PART 6 – ACCEPTANCE

### 6.01 ACCEPTANCE

Upon satisfactory completion of all decontamination procedures, a certificate will be issued by the Construction Project Manager with copies to all parties.

## **ASBESTOS ABATEMENT**

- A. A letter of Compliance stating that all the work on the project was performed in accordance with the Specifications and all applicable Federal, State and Local regulations.
- B. All warranties as stated in the Specifications.

**END OF SECTION 028213**

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**SECTION 032000**

**CONCRETE REINFORCEMENT**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

The Contractor shall furnish all equipment, materials and labor, and carry out all operations necessary for supplying and placing epoxy coated steel bars, epoxy coated welded wire fabric and accessories for concrete reinforcement as shown on the Drawings and specified herein, or as directed by the Construction Manager. All welded wire fabric installed shall be epoxy coated.

**1.02 RELATED WORK**

**SECTION: CAST-IN-PLACE STRUCTURAL CONCRETE**

**1.03 APPLICABLE REFERENCES**

The publications listed below form part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only and shall be the latest published version.

**A. American Concrete Institute (ACI)**

ACI 117	Standard Tolerances for Concrete Construction and Materials
ACI 318	Building Code Requirements for Reinforced Concrete
ACI SP-66	Detailing Manual

**B. American Society for Testing Materials (ASTM)**

ASTM A82	Standard Specification for Steel Wire, Plains, for Concrete Reinforcement
ASTM A184	Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete reinforcement
ASTM A185	Specification for Steel Welded Wire, Fabric, Plain, for Concrete Reinforcement
ASTM A496	Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement
ASTM A497	Welded Deformed Steel Wire Fabric for Concrete Reinforcement
ASTM A615	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A767	Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
ASTM A775	Standard Specification for Epoxy-Coated Reinforcing Steel Bars
ASTM A884	Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement

**C. American Welding Society (AWS)**

AWS D1.4	Structural Welding Code--Reinforcing Steel
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**1.04 SUBMITTALS**

- A. Placing Drawings: Placing drawings shall be submitted to the Construction Manager for review in accordance with SECTION: SUBMITTALS. Drawings shall be prepared in accordance with ACI SP-66.
- B. The Contractor shall submit for approval bar lists and bending schedules of all reinforcement.
- C. Test Reports: Certified mill test reports showing physical and chemical analysis shall be submitted to the Construction Manager for each shipment of reinforcing steel. Reports shall be identified with specific lots prior to use of the steel in the work.

**PART 2 - PRODUCTS**

**2.01 MATERIALS**

- A. Steel Reinforcement Bars: Steel bars shall conform to ASTM A615, deformed Grade 60.
- B. Welded Wire Fabric: Welded wire fabric shall conform to ASTM A185 or ASTM A497 as indicated on the drawings.
- C. Epoxy Coated Reinforcing Bars and Welded Wire Fabric
  - 1. Reinforcing bars shall be epoxy coated in accordance with ASTM A775 & A884.
  - 2. Any damaged epoxy-coating shall be repaired with patching material conforming to ASTM A775 and A884. Repair shall be done in accordance with the patching material manufacturer's recommendations.
- D. Bar Mats
  - 1. Bar mats shall conform to ASTM A184 and shall be fabricated from reinforcing bars that conform to ASTM A615.
  - 2. Bar mats may be fabricated from epoxy-coated reinforcing bars. Metal clips shall be epoxy-coated. Non-metallic clips may be used. Coating damage at the clipped or welded intersections shall be repaired in accordance with the specifications herein.
- E. Welded Wire Fabric Reinforcement
  - 1. Welded wire fabric for the reinforcement of concrete shall be of cold drawn steel wire of the cross-sectional area indicated on the Contract Drawings and of the type approved by the Engineer. The main reinforcing wires shall be parallel to the shortest dimension of the concrete slab, except where otherwise indicated on the Contract Drawings. The wire fabric shall be lapped at splices.



2. Cold drawn steel wire shall conform to the requirements of ASTM A185.

F. Accessories:

1. Bar Supports: Bar supports shall conform to ACI SP-66. Bar supports for formed surfaces, which are to be exposed to view, or painted shall be plastic-protected or stainless steel-protected wire or precast concrete blocks. Precast concrete block bar supports shall be not larger than 3-1/2 by 3-1/2 inches and of thickness equal to the indicated concrete cover. Blocks for use against vertical forms or in other locations where the blocks must be held in position shall have embedded tie wires for tying the blocks to the bars. If formed surface is to be exposed to view, the blocks shall be of the same quality, texture, and color as the finish surface.
2. Tie Wire: Tie wire shall be black annealed wire, 16 gage or heavier.

**PART 3 - EXECUTION**

**3.01 BENDING OF REINFORCEMENT BARS**

Reinforcing bars shall be shop bent. Bars shall be bent cold unless otherwise authorized by the Construction Manager. No bar partially embedded in concrete shall be bent unless otherwise indicated on the Drawings or authorized by the Construction Manager. Hooks and bends shall be in accordance with ACI 318.

**3.02 PLACING**

- A. General: Reinforcing steel and accessories shall be placed as specified and as shown on the Contract Drawings and approved Placing Drawings. Placement details not specified or shown on the drawings shall be in accordance with ACI 318 or ACI SP-66. Reinforcement shall be fabricated to the shapes and dimensions shown, placed where indicated within specified tolerances, and adequately supported during concrete placement.
- B. Reinforcement bars shall be protected from the weather until placed in the work. Reinforcement bars shall be cleaned and scaled and rust removed therefrom before placing of concrete.
- C. No concrete shall be deposited until the Construction Manager has inspected the placing of reinforcing steel and given permission to place concrete. All concrete placed in violation of this provision shall be rejected and shall be removed, at no expense to the City.

**3.03 INSTALLATION OF EPOXY COATED REINFORCING BARS AND WIRE MESH**

- A. Epoxy-coated reinforcing bars and wire mesh supported with form work shall rest on coated wire bar supports, or on bar supports made of dielectric material or other acceptable materials. Wire bar supports shall be coated with dielectric material, for a minimum distance of 2 inches from the point of contact with the epoxy-coated reinforcing

bars. Reinforcing bars used as support bars or wire shall be epoxy coated. Proprietary combination bar clips and spreaders used in walls with epoxy-coated reinforcing bars shall be made of corrosion-resistant material.

- B. Epoxy-coated reinforcing bars and wires mesh shall be fastened with nylon-, epoxy-, or plastic-coated tie wire.
- C. Splices of reinforcing bars and wire mesh shall be made only as required or permitted by the Contract Documents, or as authorized by the Construction Manager.
- D. When epoxy-coated reinforcing bars or wire mesh are cut in the field, the ends of the bars shall be coated with the same material used for repair of coating damage.

#### 3.04 REINFORCING STEEL AND WIRE MESH TO BE FASTENED

- A. Where reinforcing steel or wire mesh is used, satisfactory means shall be provided to maintain it in the exact position it is to occupy in the completed work and to prevent it from becoming dislodged or moved in any manner. For this purpose annealed 18 gauge iron wire or approved clips shall be used at all intersections, and the reinforcement shall be securely supported by approved metal chairs or hangers.
- B. The mesh shall be maintained in position by the use of suitable spacers or by other approved means and at a distance from the face of the steel members as directed by the Construction Manager.

#### 3.05 DOWELS

Dowels, conforming to the requirements for deformed bars specified in Paragraph 2.01.1, Steel Reinforcement Bars, shall be provided for securing the existing structure to the new construction, as indicated on the Contract Drawings and as required by the Construction Manager. Holes shall be cut to the lines indicated and the dowels grouted in place.

#### 3.06 WELDING

Welding of reinforcing bars including welding of crossing bars (tack welding) shall be permitted only where indicated on the Drawings or as otherwise directed by Construction Manager. When welding is permitted, it shall be performed in accordance with AWS D1.4 except where otherwise specified or indicated on the Drawings.

#### 3.07 FABRICATING AND PLACING TOLERANCES

Reinforcing bars shall be fabricated and placed to the tolerances given in ACI 117. Bars may be moved as necessary to avoid interference with other reinforcing steel, conduits, or embedded items. If bars are moved more than one bar diameter or enough to exceed the above specified tolerances, the resulting arrangement of bars shall be subject to approval by the Engineer.

#### 3.08 SPLICING

Splices in reinforcing steel shall be as shown on the Drawings and as specified. Bars may be spliced at alternative or additional locations at no additional cost to the City, and subject to the approval of Engineer. Except as provided herein, splicing shall be in accordance with approved splicing procedures and the requirements of ACI 318. Lap splices shall be used for bar sizes #3 through #11. Bar laps may be placed in contact and securely tied or may be spaced transversely apart to permit the embedment of the entire surface of each bar in concrete. Lengths of laps for bars or welded wire fabric shall conform to the requirements of ACI 318, except when otherwise shown on the Drawings.

END OF SECTION

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SECTION 033000

CAST IN PLACE CONCRETE – MONITORING BOOTH, M&R BUILDING

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 WORK INCLUDED

- A. Work of this section includes all labor, materials, equipment and services necessary to complete the concrete work as shown on the drawings and specified herein, including, but not limited to the following:
  - 1. Slabs on grade.
  - 2. Stair pan fills.
  - 3. Furnishing and installing all required anchors and inserts.
  - 4. Placing in the forms all inserts, anchors, anchor bolts, bearing plates and the like furnished by other trades for casting into the concrete and cleaning of same after stripping of forms.
  - 5. Protection of all inserts, anchors, hangers, sleeves and supports furnished and set by others for the attachment of other work to the concrete, or required to permit the passage of other work through the concrete.
  - 6. Supply, fabricate and place all required reinforcing bars, mesh, fibers and other reinforcement for concrete where shown, called for, and/or required complete with proper supporting devices.
  - 7. Erection and removal of all formwork and forms required to properly complete the work.
  - 8. Finishing of all concrete work as herein after specified.
  - 9. Curing and protection of all concrete and cement work.
  - 10. Site concrete consisting of curbs, walks, pads, boxes and the like as shown on the drawings.
  - 11. Cutting, patching, grouting, repairing and pointing up as required.
  - 12. Grouting of all beam bearing plates and column base plates.
  - 13. Equipment pads as required.
  - 14. All other work and materials as may be reasonably inferred and needed to make the work of this section complete.

1.3 RELATED WORK

- A. Masonry work.
- B. Structural steel.
- C. Miscellaneous metal work.
- D. Carpentry.

#### **1.4 SUBMITTALS**

- A. **Product Data:** Submit data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, and others as requested by Architect.
- B. **Shop Drawings; Reinforcement:** Submit original shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Details and Detailing of Concrete Reinforcement" showing bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement. Include special reinforcement required for openings through concrete structures. The shop drawings shall be prepared only by competent detailers, checked by the contractor prior to submission.
  - 1. The shop drawings shall show construction, contraction and isolation joint locations and the added reinforcement required at same.
  - 2. Obtain and coordinate information for sleeves and openings in concrete, which are required for the work of other trades. Make coordinated drawings showing size and location of openings and sleeves and incorporate this information on the reinforcing drawings.
  - 3. Only those splices indicated on the approved shop drawings will be permitted.
  - 4. Provide elevations of all foundation walls and other structural elements to a minimum 1/4" scale.
- C. **Samples:** Submit samples of materials as requested by Architect, including names, sources and descriptions.
- D. **Laboratory Test Reports:** Submit laboratory test reports for concrete materials, mix design test.
- E. **Material Certificates:** Provide materials certificates in lieu of materials laboratory test reports when permitted by Architect. Manufacturer and Contractor, certifying that each material item complies with, or exceeds, specified requirements should sign material certificates. Provide certification from admixture manufacturers that chloride content complies with specification requirements.

#### **1.5 QUALITY ASSURANCE**

- A. **Codes and Standards:** Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or specified:
  - 1. **New York City Building Code. Form TR-3: Technical Report Concrete Design Mix:** The contractor shall be responsible for, and bear all costs associated with the filing and securing of approvals, if any, for Form TR3: Technical Report Concrete Design Mix, including, but not limited to, engaging the services of a New York City licensed Concrete Testing Lab for the review and approval of concrete design mix, testing, signatures and professional seals, etc., compliant with NYC Department of Buildings requirements, for each concrete design mix.
  - 2. **ACI 117-90 "Standard Specifications for Tolerances for Concrete Construction and Materials".**
  - 3. **ACI 301-99 "Specifications for Structural Concrete for Buildings".**
  - 4. **ACI 214, "Recommended Practice for Evaluation of Strength Test Results of Concrete."**
  - 5. **ACI 311, "Guide for Concrete Inspections".**
  - 6. **ACI 315, "Details and Detailing of Concrete Reinforcement".**
  - 7. **ACI 318-02 "Building Code Requirements for Structural Concrete".**

8. ACI 211.1-91 "Standard Practice for Selecting Proportions for Normal, Heavyweight and mass concrete".
9. ACI 211.2, "Guide for Selecting Proportions for No Slump Concrete".
10. ACI 304, "Guide for Measuring, Mixing, Transporting and Placing Concrete".
11. ACI 302. 1R-96 Guide for Concrete Floor and Slab Construction.
12. ACI 305 R-99 Hot Weather Concreting.
13. ACI 306 R-97 Cold Weather Concreting.
14. ACI 308-97 Standard Practice for Curing Concrete.
15. ACI 347 R-99 "Guide to Formwork of Concrete".
16. ACI 309, "Guide for Consolidation of Concrete".
17. CRSI-WCRSI, "Placing Reinforcing Bars".
18. AWS D1.4, "Structural Welding Code Reinforcing Steel".
19. The ACI Field Reference Manual, SP-15 shall be kept at the job site, and the practices set forth therein shall be strictly adhered to.
20. ASTM C 494 Standard Specification for Chemical Admixtures for Concrete.
21. Concrete Reinforcing Steel Institute, (CRSI) "Manual of Standard Practice".
- B. Concrete Testing Service: Commissioner will engage a testing laboratory acceptable to Architect to perform material evaluation tests and to design concrete mixes.
- C. Materials and installed work may require testing and retesting at any time during progress of work. Tests, including retesting of rejected materials for installed work, shall be done at Contractor's expense.

#### 1.6 PROJECT CONDITIONS

- A. The contractor, before commencing work, shall examine all adjoining work on which this work is in any way dependent for proper installation and workmanship according to the intent of this specification, and shall report to the Architect/Engineer any condition that prevents this contractor from performing first class work.
- B. Protection of Footings Against Freezing: Cover completed work at footing level with sufficient temporary or permanent cover as required to protect footings and adjacent subgrade against possibility of freezing; maintain cover for time period as necessary.
- C. Protect adjacent finish materials against spatter during concrete placement.
- D. Provide all barricades and safeguards at all pits, holes, shaft and stairway openings, etc., to prevent injury to workmen and others within and about the premises. Also provide all safeguards as required by the Building Code, OSHA, or any other departments having jurisdiction. Take full responsibility for all safety precautions and methods.
- E. Procedure of Work: The contractor shall keep himself constantly informed as to the progress of the work in the field, materials and men ready to start work immediately when conditions of preceding work are available or ready, wholly or in part, so as not to delay the progress of building work or to interfere with the progress of work of other contractors, and in any event he shall, within 24 hours after notice from the Commissioner, proceed with such work as directed to maintain the uninterrupted progress of the work.

#### 1.7 GUARANTEE

Upon completion of all work to be performed under this contract and acceptance of same by the Commissioner, the contractor shall execute and deliver in a form satisfactory to the

Commissioner, a guarantee that all workmanship and materials used in the performance of the contract shall remain free from defects for a period of one year from the date of the final certificate of occupancy.

## **PART 2 - PRODUCTS**

### **2.1 FORM MATERIALS**

- A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct of plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient strength and thickness to withstand pressure of newly placed concrete without bow or deflection.
  - 1. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better mill oiled and edge-sealed, with each piece bearing legible inspection trademark.
- B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.
- C. Form Coatings: Provide VOC compliant commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.
- D. Form Ties: Form ties and spreaders: prefabricated assemblies by Richmond; Superior, Dayton or approved equal. Wire ties SHALL NOT BE USED. Ties for foundation work shall be of snap design with removal cones and water seal washer.
- E. Where indicated, use polystyrene foam fill, conforming to ASTM C578. Subject to compliance with requirements, provide one of the following:
  - 1. "Styrofoam HighLoad" by Dow
  - 2. "Foamular" by Owens Corning

### **2.2 REINFORCING MATERIALS**

- A. Reinforcing Bars: ASTM A 615, Grade 60, and deformations ASTM A305.
- B. Epoxy-Coated Reinforcing Bars: ASTM A 775 (as noted on plan and/or in section).
- C. Fiber Reinforcing: ASTM C1116.
- D. Steel Wire: ASTM A 82, plain, cold-drawn steel.
- E. Welded Wire Fabric: ASTM A 185, welded steel wire fabric.
- F. Welded Deformed Steel Wire Fabric: ASTM A 497.
- G. Supports for Reinforcement: Bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI specifications.
  - 1. For epoxy-coated reinforcement provide plastic protected chairs and plastic ties. All imperfections in the epoxy coating are to be repaired prior to placement of concrete.
  - 2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class I) or stainless steel protected (CRSI, Class 2), at a spacing not to exceed 4'-0" on center in either direction.



## 2.3 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I.
  - 1. Use one brand of cement throughout project, unless otherwise acceptable to Architect.
- B. Normal Weight Aggregates: ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.
  - 1. Local aggregates not complying with ASTM C 33 but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used when acceptable to Architect.
  - 2. Normal weight Fine Aggregate: washed, inert, natural or manufactured or combination thereof, sand conforming ASTM C33 gradation.
  - 3. Normal weight Coarse Aggregate: well graded crushed stone or washed gravel conforming to ASTM C33, sizes 57 for foundations and 67 for slabs and structure.
- C. Lightweight Aggregates: ASTM C 330.
- D. Water: Drinkable.
- E. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. "Air-Mix or AEA 92": Euclid Chemical Co.
    - b. "MB-VR or MB-AE": Master Builders.
    - c. "Sika Aer": Sika Corp.
    - d. "Darex AEA" or "Daravair": W.R. Grace.
- F. Water-Reducing Admixture: ASTM C 494, Type A, and containing not more than 0.05 percent chloride ions.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. "Eucon WR-75, WR-89 or MR": Euclid Chemical Co.
    - b. "Pozzolith 322N": Master Builders.
    - c. "Plastocrete 160": Sika Chemical Corp.
    - d. "WRDA Hycol": W.R. Grace.
- G. High-Range Water-Reducing Admixture (Superplasticizer): ASTM C 494, Type F or Type G and containing not more than 0.05 percent chloride ions.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. "Eucon 37, 1037 or Plastol 5000": Euclid Chemical Co.
    - b. "Rheobuild 1000": Master Builders
    - c. "Sikament 300": Sika Chemical Corp.
    - d. "Daracem-100": W. R. Grace
- H. Water Reducing, Non-Corrosive Accelerating Admixture: The admixture shall conform to ASTM C 494, Type C or E, and not contain more chloride ions than are present in municipal drinking water. The admixture manufacturer must have long-term non-corrosive test data from an independent testing laboratory (of at least a year's duration) using an acceptable accelerated corrosion test method such as that using electrical potential measures.
  - 1. Products: Subject to compliance with requirements, provide the following:
    - a. "Accelguard 80": Euclid Chemical Co.
    - b. "Daraset": W. R. Grace
    - c. "Pozzutec 20": Master Builders.
- I. Water-Reducing, Retarding Admixture: ASTM C 494, Type D, and contain not more than 0.05 percent chloride ions.

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. "Eucon Retarder 75": Euclid Chemical Co.
  - b. "Pozzolith 100XR": Master Builders.
  - c. "Plastiment": Sika Chemical Co.
  - d. "Daratard": W.R. Grace.
- J. Microsilica Admixture shall be dry densified or slurry formed. Microsilica shall come from the same source throughout the project. If a single source cannot be maintained, laboratory testing of each new source shall be required before acceptance by the engineer at no cost to the City of New York.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. "Emsac F 100": Elkem Chemical, Inc.
    - b. "Eucon MSA": Euclid Chemical Co.
    - c. "Force 10,000": W. R. Grace
- K. Prohibited Admixtures: Calcium chloride, thiocyanates or admixtures containing more than 0.05 percent chloride ions are not permitted.
- L. Certification: Written conformance to the above-mentioned requirements and the chloride ion content of admixtures will be required from the admixture manufacturer prior to mix design review by the Engineer.
- M. Structural Fibers: A patented coarse monofilament, self-fibrillating, polypropylene/polyethylene fiber. Provide "Tuf Strand SF" (The Euclid Chemical Company) or approved equal.
- N. Synthetic Fibers: Monofilament of fibrillated polypropylene fibers for secondary reinforcing of concrete slabs and members. The product shall have a UL rating.
  1. Products: Subject to compliance with requirements, provide the following:
    - a. "Fiberstrand": Euclid Chemical Co.
    - b. "Fibermesh": Fibermesh, Inc.
    - c. "Forta CR": Forta Fibre, Inc.
- O. Corrosion Inhibitor: 30% calcium nitrite (where called for in the specifications or on the drawings).
  1. Subject to compliance with requirements, provide the following at 3 gal/cy:
    - a. "Eucon CIA": Euclid Chemical
    - b. "DCI": W. R. Grace
    - c. "Rheocrete CNI": Master Builders.
- P. Contractor will be required to provide information demonstrating successful use in prior placement involving all admixtures.

## 2.4 RELATED MATERIALS

- A. Waterstops: Provide water stops at construction joints and other joints as indicated Size to suit joints.
  1. Bentonite Waterstops: Extruded 25% butyl rubber and 75% sodium bentonite in formed strips, series RX-101 and RX-102 waterstops by CETCO or equal.
- B. Non-Shrink, Non-Metallic Grout: The non-shrink grout shall be a factory pre-mixed grout and shall conform to ASTM C1107, "Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-Shrink)." In addition, the grout manufacturer shall furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95% bearing under a 4' x 4' base plate.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. "Euco-NS": Euclid Chemical Co.
    - b. "Five Star Grout": U.S. Grout Corp.

- c. "Masterflow 713": Master Builders.
- C. High Flow Grout: Where high fluidity and/or increased placing time is required, use high flow grout. The factory pre-mixed grout shall conform to ASTM C1107, "Standard Specification for Packages Dry, Hydraulic-Cement Grout (Non-shrink)." In addition, the grout manufacturer shall furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95% bearing under a 18" x 36" base plate.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. "Euco Hi-Flow Grout" Euclid Chemical Co.
    - b. "Masterflow 928" Master Builders
- D. Non-slip Aggregate Finish: Provide fused aluminum oxide grits, or crushed emery, as abrasive aggregate for non-slip finish with emery aggregate containing not less than 40% aluminum oxide and not less than 25% ferric oxide. Use material that is factory-graded, packaged, rustproof and non-glazing, and is unaffected by freezing, moisture, and cleaning materials.
- E. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.
- F. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
  - 1. Waterproof paper.
  - 2. Polyethylene film.
  - 3. Polyethylene-coated burlap.
- G. Curing Compounds
  - 1. Clear Curing and Sealing Compound (VOC Compliant – 350 g/L): The compound shall have 30% solids content minimum, and will not yellow under ultra violet light after 500 hours of test in accordance with ASTM D4887 and will have a maximum moisture loss of 0.039 grams per sq. cm. when applied at a coverage rate of 250 sq. ft. per gallon.
    - a. Products: Subject to compliance with requirements, provide one of the following:
      - 1) "Super Rez Seal VOX" Euclid Chemical Co.
      - 2) "Super Diamond Clear VOX" Euclid Chemical Co.
      - 3) "MasterKure 200W" Master Builders.
  - 2. Curing Compound (Strippable): The compound shall conform to ASTM C 309. For use on slabs receiving a subsequent finish and as noted on the drawings.
    - a. Products: Subject to compliance with requirements, provide one of the following:
      - 1) "Kurez DR VOX or Kurez W VOX": Euclid Chemical
- H. Crack Sealer: Elastomeric liquid crack sealer resistant to water, gasoline, oil and salts.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. "Plasti-seal": Euclid Chemical Co.
- I. Underlayment Compound: Free flowing, self-leveling, pumpable cementitious base compound.
  - 1. Products: Subject to compliance with requirements, provide the following:
    - a. "Flo-Top 90 or Super Flo-Top" Euclid Chemical Co.
    - b. "Ardex" Ardex Co.
    - c. "Underlayment 110" Master Builders
- J. Bonding Admixture: The compound shall be a latex, non-rewettable type.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. "Flex-Con": Euclid Chemical Co.
    - b. "Daraweld C": W.R. Grace

- c. "SBR Latex" Euclid Chemical Co.
- K. High Strength Polymer Repair Mortar: For form and pouring or large horizontal repairs, provide the flowable on-part, high strength repair mortar.
  - 1. Products: subject to compliance with requirements, provide the following:
    - a. "Eucocrete" The Euclid Chemical Co.
    - b. "Euco Speed MP" (Cold Weather) The Euclid Chemical Co.
    - c. "Emaco R" Master Builders.
- L. Evaporation Retardant:
  - 1. Products Subject to compliance with requirements, provide one of the following:
    - a. "Eucobar" Euclid Chemical Co.
    - b. "Confilm" Master Builders
- M. Vapor Barrier: Provide vapor barrier which conforms to ASTM E1745, Class A or B. The membrane shall have a water-vapor permeance rate no greater than 0.01 perms as tested after conditioning (ASTM 1745 paragraphs 7.1.2-5). The vapor barrier shall be placed over prepared base material where indicated below slabs on grade. Vapor barrier shall be no less than 10 mil thick in accordance with ACI 302.1R-96.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. "Stego Wrap (15 mil) Vapor Barrier": Stego Industries LLC
    - b. "Griffolyn Vaporguard": Reef Industries
    - c. "Premoulded Membrane with PLASTMATIC CORE": W.R. Meadows.
- N. Liquid Sealer/Densifier: High performance, deeply penetrating concrete densifier; odorless, colorless, VOC - compliant, non-yellowing silicate based solution designed to harden, dustproof and protect concrete floors subjected to heavy vehicular traffic and to resist black rubber tire marks on concrete surfaces. The compound must contain a minimum solids content of 20% of which 50% is silicate.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. "Euco Diamond Hard" Euclid Chemical Co.
    - b. "Seal Hard" L & M Chemical Co.

## 2.5 PROPORTIONING AND DESIGN OF MIXES

### A. Preparation of Design Mixes:

- 1. All mix designs shall be proportioned in accordance with Section 5.3, "Proportioning on the Basis of Field Experience and/or Trial Mixtures" of ACI 318-02 and prepared by a licensed testing laboratory approved by the Commissioner, but paid for by the contractor. Form TR3: Technical Report Concrete Design Mix: The contractor shall be responsible for, and bear all costs associated with the filing and securing of approvals, if any, for Form TR3: Technical Report Concrete Design Mix, including, but not limited to, engaging the services of a New York City licensed Concrete Testing Lab for the review and approval of concrete design mix, testing, signatures and professional seals, etc., compliant with NYC Department of Buildings requirements, for each concrete mix.
- 2. If previously used mixes are submitted, all materials shall be from the same sources and with the same brand names as the previously utilized mix.
- 3. If trial batches are used, the mix design shall be prepared by an independent testing laboratory and shall achieve an average compressive strength 1200 psi higher than the specified strength. This over-design shall be increased to 1400 psi when concrete strengths of 5000 or more are used.

4. The proposed mix designs shall be accompanied by complete standard deviation analysis or trial mixture test data.
- B. Do not begin concrete production until Architect has reviewed and approved mixes.
- C. Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:
  1. Concrete for structural topping slab, poured in place slabs, on ground or exposed to weather, shall have a compressive strength of 4000 psi at 28 days and a water cement ratio not greater than 0.40 and shall be watertight with high range water reducing agent, microsilica admixture, structural fibers, synthetic fibers, air-entraining admixture and corrosion inhibitor and shall be moist cured with a moisture-retaining cover per section 2.4G..
  2. Self-Consolidating Concrete (SCC): Minimum flow of 20" or as required by the successful test placement. All self-consolidating concrete shall contain the specified high-range water-reducing admixture and viscosity-enhancing admixture as required.
- D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to the City of New York and as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.
- E. Admixtures:
  1. Use water-reducing admixture or high range water-reducing admixture (superplasticizer) as required for placement and workability.
  2. Use non-corrosive, non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50°F (10°C).
  3. Use high-range water-reducing admixture in pumped concrete, concrete for industrial slabs, architectural concrete, parking structure slabs, fiber concrete, concrete required to be watertight, concrete with ultimate strength of 5,000 psi or more, and concrete with water/cement ratios below 0.50.
  4. Use air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus-or-minus 1-1/2 percent within following limits:
    - a. Concrete structures and slabs exposed to freezing and thawing deicer chemicals, or subjected to hydraulic pressure:
      - 1) 4.5 percent (moderate exposure); 5.5 percent (severe exposure) - 1-1/2" max. aggregate
      - 2) 4.5 percent (moderate exposure); 6.0 percent (severe exposure) - 1" max. aggregate.
      - 3) 5.0 percent (moderate exposure); 6.0 percent (severe exposure) - 3/4" max. aggregate.
      - 4) 5.5 percent (moderate exposure); 7.0 percent (severe exposure) - 1/2" max. aggregate.
    - b. Other Concrete: (not exposed to freezing, thawing, or hydraulic pressure): 2 percent to 4 percent air.
    - c. Interior concrete subjected to vehicular traffic: 3 percent maximum.
  5. Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.
- F. Water-Cement Ratio: Provide concrete for following conditions with maximum water-cement (W/C) ratios as follows:

1. Subjected to freezing and thawing; W/C 0.50.
2. Subjected to deicers/watertight; W/C 0.45.
3. Reinforced concrete subjected to brackish water, salt spray or deicers; W/C 0.40.
- G. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
  1. Ramps slabs and sloping surfaces: Not more than 3".
  2. Reinforced foundation systems, including mud slabs below hydrostatic slabs: Not less than 1" and not more than 3".
  3. Concrete containing HRWR admixture (superplasticizer): Not more than 9" unless otherwise approved by the architect. The concrete shall arrive at the job site at a slump of 2" to 3" (3" to 4" for concrete receiving a "shake-on" hardener or lightweight concrete), be verified, then the high-range water-reducing admixture added to increase the slump to the approved level.
  4. Other Concrete: Not less than 1" or more than 4".
- H. Chloride Ion Level: The total chloride ion content of the mix including all constituents shall not exceed the limitations set forth in Table 4.4.1 of ACI 318-02 for concrete subjected to deicers or exposed to chloride in service (0.15 chloride ions by weight of cement).
- I. Concrete coloration: For all exposed concrete except roofing, use Scofield Chromix Charcoal C-24 with liquid sealer, as directed by Architect.

## 2.6 CONCRETE MIXING

- A. Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as herein specified.
- B. Provide batch ticket for each batch discharged and used in work, indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.
- C. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required. When air temperature is between 85°F (30°C) and 90°F (32°C), reduce maximum mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90°F (32°C), reduce maximum mixing and delivery time to 60 minutes.
- D. No water shall be added after mixing to concrete containing HRWR (Superplasticizer). If loss of slump occurs, the concrete treated with HRWR may be re-dosed as long as a "flash set" has not occurred. Re-dosage procedures must be discussed and approved by the Engineer and the manufacturer.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Coordinate the installation of joint materials and vapor retarders with placement of forms and reinforcing steel.

### 3.2 INSPECTION

- A. Examine all work prepared by others to receive work of this section and report any defects affecting installation to the contractor for correction. Commencement of work will be construed as complete acceptance of preparatory work by others.

### 3.3 CONCRETE

- A. Concrete shall develop the minimum compressive strengths shown on drawings at 28 days when sampled and tested in accordance with ASTM C31 and C39 with the maximum slump in accordance with the approved mix design.
- B. Concrete shall be in accordance with the requirements and specifications of NY City Building Code and ACI 318 - "Building Code Requirements for Structural Concrete", latest edition, as modified by the NY City Building Code.

### 3.4 FORMS

- A. Design, erect, support, brace and maintain formwork to support vertical and lateral, static, and dynamic loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shapes, alignment, elevation and position. Maintain formwork construction tolerances complying with ACI 347. Provide Class A tolerances for concrete exposed to view. Provide Class C tolerances for other concrete surfaces.
- B. Design formwork to be readily removable without impact, shocks or damage to cast-in-place concrete surfaces and adjacent materials.
- C. Construct forms to size shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.
- D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, recesses, and the like, to prevent swelling and for easy removal.
- E. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.
- F. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- G. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.
- H. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retightening forms and bracing after concrete placement is required to eliminate mortar leaks and maintain proper alignment.

### **3.5 VAPOR BARRIER INSTALLATION**

- A. Following leveling and tamping of granular base for slabs on grade, place vapor barrier sheeting with longest dimension parallel with direction of pour.
- B. Lap joints 6" and seal with appropriate tape.
- C. After placement of moisture barrier, cover with granular material and compact to depth as shown on drawings.
- D. Avoid cutting or puncturing vapor barrier during reinforcement placement and concreting operations.

### **3.6 PLACING REINFORCEMENT**

- A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials, which reduce or destroy bond with concrete.
- C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.
- D. Place reinforcement to obtain at least minimum coverage's for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.
- F. Structural and Synthetic Fibers: All topping slabs and where indicated on the drawing shall contain the specified structural fibers. They shall be 2" in length and used at a dosage rate of 5 lbs. per cubic yard. All foundation concrete and hydrostatic slabs and where indicated on the drawings shall contain the specified synthetic fibers. They shall be 3/4" in length and used at the dosage rate of 8.0 million fibers or 1.0 lbs. per cu. yd.
- G. Epoxy-coated reinforcing bars supported from formwork shall rest on coated wire bar supports. Reinforcing bars used as support bars shall be epoxy-coated. In walls having epoxy-coated reinforcing bars, spreader bars where specified by the Engineer/Architect, shall be epoxy-coated. Proprietary combination bar clips and spreaders used in walls with epoxy-coated reinforcing bars shall be made of corrosion-resistant material.
- H. Epoxy-coated reinforcing bars shall be fastened with nylon-, epoxy-, or plastic-coated tie wire, or other acceptable materials.
- I. Repair of damaged epoxy-coating when required, damaged epoxy-coating shall be repaired with patching material conforming to ASTM A 775. Repair shall be done in accordance with the patching material manufacturer's recommendations.
- J. Unless permitted by the Engineer/Architect, epoxy-coated reinforcing bars shall not be cut in the field. When epoxy-coated reinforcing bars are cut in the field, the ends of the bars shall be coated with the same material used for repair of coating damage.

### **3.7 JOINTS**



- A. Construction Joints: Locate and install construction joints as indicated, or if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable to Architect.
- B. Provide keyways at least 1-1/2" deep in construction joints in walls, slabs and between walls and footings, where noted; accepted bulkheads designed for this purpose may be used for slabs.
- C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints, except as otherwise indicated.
- D. Waterstops: Provide waterstops in construction joints as indicated. Install waterstops to form continuous diaphragm in each joint. Make provisions to support and protect exposed waterstops during progress of work. Fabricate field joints in waterstops in accordance with manufacturer's printed instructions, using manufacturer's specified welding irons.
- E. Isolation Joints in Slabs-on-Ground: Construct isolation joints in slabs-on-ground at points of contact between slabs-on-ground and vertical surfaces, such as column pedestals, foundation walls, grade beams and elsewhere as indicated.
- F. Contraction (Control) Joints in Slabs-on-Ground: Maximum joint spacing shall be 36 times the slab thickness unless otherwise noted on the drawings. The dry cut saw shall be used immediately after final finishing and to a depth of 1-1/4". Alternatively, a conventional saw shall be used as soon as possible without dislodging aggregate and to a depth of 1/4 slab thickness.

### 3.8 INSTALLATION OF EMBEDDED ITEMS

- A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.
- B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

### 3.9 PREPARATION OF FORM SURFACES

- A. Clean re-used forms of concrete matrix residue, repair and patch as required to return forms to acceptable surface condition.
- B. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.
- C. Thin form-coating compounds only with thinning agent of type, and amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.
- D. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

### 3.10 CONCRETE PLACEMENT

- A. Ready-mix concrete shall comply with the requirements of ASTM C94 and ACI 304. All plant and transporting equipment shall comply with the concrete plant standards and truck mixer and agitator standards of the National Ready Mix Concrete Association.
- B. Cold weather mixing procedures shall be submitted to the architect for approval.
- C. Notify architect and testing organization at least 72 hours (3 regular working days) before each pour so that forms and reinforcing may be examined. Do not place concrete until inspection has been made or waived.
- D. **Preplacement Inspection:** Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.
  - 1. Apply temporary protective covering to lower 2' of finished walls adjacent to poured floor slabs and similar conditions, and guard against spattering during placement.
- E. **General:** Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete", and as herein specified.

Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete that has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.
- F. **Placing Concrete in Forms:** Deposit concrete in forms in horizontal layers not deeper than 18" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints. Use internal vibrators penetrating both the top and preceding layers.
- G. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.
- H. Use and type of vibrators shall conform to ACI 309 "Recommended Practice for Consolidation of Concrete". Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.
- I. **Placing Concrete Slabs:** Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.
- J. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
- K. Bring slab surfaces to correct level with straightedge and strikeoff. Use highway straightedge, bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations. See also "MONOLITHIC SLAB FINISHES" below.
- L. Maintain reinforcing in proper position during concrete placement operations.
- M. **Cold Weather Placing:** Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.

1. When air temperature has fallen to or is expected to fall below 40°F (4°C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50°F (10°C), and not more than 80°F (27°C) at point of placement.
  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. Use only a non-corrosive, non-chloride accelerator. Calcium chloride, thiocyanates or admixtures containing more than 0.05% chloride ions are NOT permitted.
- N. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90°F (32°C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.
  2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
  3. Fog spray forms, reinforcing steel and subgrade just before concrete is placed.
  4. Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

### 3.11 FINISH OF FORMED SURFACES

- A. Rough Form Finish: For formed concrete surface not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.
- B. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, damp-proofing, painting or other similar system. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed. Follow all requirements in ACI 301, Chapter 10 for smooth form finish. Surface preparation for surfaces receiving waterproofing must be approved by the waterproofing manufacturer prior to construction.

### 3.12 FLOOR FLATNESS/LEVELNESS TOLERANCES

- A. FF defines the maximum floor curvature allowed over 24 in. Computed on the basis of successive 12 in. (300 mm) elevation differentials, FF is commonly referred to as the "Flatness F-Number".
- B. FL defines the relative conformity of the floor surface to a horizontal plane as measured over a 10 ft. (3.05 m) distance commonly referred to as the "Levelness F-Number".
- C. All floors shall be measured within 72 hours of being poured and in accordance with ASTM E-1155 "Standard Test Method for Determining Floor Flatness and Levelness Using the "F Number" System (Inch-Pound Units).

- D. All slabs shall achieve the specified overall tolerance. The minimum local tolerance (1/2 bay or as designated by the architect) shall be 2/3 of the specified tolerances.
- E. All elevated slabs shall achieve the specified FL tolerance before the removal of the forms.
- F. All slabs on metal deck shall achieve the specified FF.

### 3.13 MONOLITHIC SLAB FINISHES

- A. Float Finish: Apply float finish to slabs at crawl spaces, unless otherwise noted. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture. Surface shall achieve an FF 20 - FL 17 tolerance.
- B. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system, unless otherwise noted. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance and with a surface leveled to an FF25/ FL 20 tolerance (FL17 for elevated slabs). Grind smooth surface defects, which would telegraph through applied floor covering system.
- C. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, and slab surfaces which are to be covered with membrane or elastic waterproofing, or sand-bed terrazzo, and as otherwise indicated, apply single trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming. Surface preparation for surfaces receiving waterproofing must be approved by the waterproofing manufacturer prior to construction.
- D. Liquid Densifier: Apply a coat of the specified liquid densifier to all exposed interior concrete floors where indicated on the drawings. This surface must be continuously moist cured by a method satisfactory to the Architect. Apply and mechanically scrub compound into the floor in strict accordance with the manufacturer's printed instructions.

### 3.14 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
  - 1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting; keep continuously moist for not less than 7 days.
  - 2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.
  - 3. In order to avoid plastic or drying shrinkage cracks during warm, dry or windy weather, ACI 302 and ACI 308 shall be followed using wind breaks and sun shades when recommended. Evaporation retardant shall be as specified in Section 2.04.

- B. Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.
1. Provide moisture curing by following methods.
    - a. Keep concrete surface continuously wet by covering with water.
    - b. Continuous water-fog spray.
    - c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.
  2. Provide moisture-cover curing as follows:
    - a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
  3. Provide curing and sealing compound to exposed interior slabs not receiving a liquid densifier application, and to all troweled slabs receiving mastic applied adhesives or "shake-on" hardeners. A clear curing and sealing compound shall be used on exterior slabs, sidewalks and curbs not receiving a penetrating sealer.
  4. Use the specified strippable curing compound on surfaces to be covered with finish or coating material applied directly to concrete, such as liquid densifier/sealer, waterproofing, dampproofing, membrane roofing, flooring, painting, and other coatings and finish materials. Apply compound in accordance with manufacturer's direction.
- C. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
- D. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of the specified curing compound or a continuous moist curing method approved by the architect.
- E. Sealer and Dustproofer: Apply a second coat of the specified curing and sealing compound to exposed interior slabs not subjected to vehicular traffic, noted on the drawings. These slabs must have received an initial coat of the curing and sealing compound.

### 3.15 REMOVAL OF FORMS

- A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50°F (10°C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.
- B. Formwork supporting weight of concrete, such as beam soffits, joints, slabs and other structural elements, may not be removed in less than 14 days and until concrete has attained design minimum compressive strength at 28-days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.

- C. Form facing material may be removed 4 days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

### 3.16 RE-USE OF FORMS

- A. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.
- B. When forms are intended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

### 3.17 MISCELLANEOUS CONCRETE ITEMS

- A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.
- D. Grout base plates and foundations as indicated using specified non-shrink grout. Use non-metallic grout for exposed conditions, unless otherwise indicated. Where high fluidity and/or increased placing time is required using the specified high flow grout. This grout shall be used for all base plates larger than 10 square feet.
- E. Steel Pan Stairs: Provide concrete fill for steel pan stair treads and landings and associated items. Cast-in safety inserts and accessories as shown on drawings. Screeds, tamp, and finish concrete surfaces as scheduled.
- F. Reinforced Masonry: Provide concrete grout for reinforced masonry lintels and bond beams where indicated on drawings and as scheduled. Maintain accurate location of reinforcing steel during concrete placement.

### 3.18 CONCRETE SURFACE REPAIRS

Prior to all repairs, an as-built condition sketch and method of repair must be submitted to the architect and engineer for review and approval.

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect. Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with a bonding grout containing the

- specified bonding admixture. Place patching mortar after while bonding grout is still tacky.
- B. For exposed-to-view surfaces, blends white portland cement and standard portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
  - C. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discoloration's that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or pre-cast cement cone plugs secured in place with bonding agent.
  - D. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.
  - E. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueens of slope, in addition to smoothness, using a template having required slope.
  - F. Repair finished unformed surfaces that contain defects, which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.
  - G. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days, except at hydrostatic slabs.  
Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. The specified underlayment compound or repair topping may be used when acceptable to Architect.
  - H. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.
  - I. Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Groove top of cracks and cutout holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry-pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.
  - J. Structural Repair: All structural repairs shall be made with prior approval of the Engineer as to method and procedure, using the specified polymer repair mortar and/or specified epoxy adhesive. Where epoxy injection procedures must be used, an approved low viscosity epoxy made by the manufacturers previously specified shall be

used. All garage slabs shall be repaired prior to the slab being treated with the specified penetrating anti-spalling sealer. In addition, all cracks shall be filled with the specified crack sealer or other method as approved by the Engineer.

- K. Underlayment Application: Leveling of floors for subsequent finishes may be achieved by use of specified underlayment material. Underlayment application shall achieve the tolerances specified in "MONOLITHIC SLAB FINISHES" above.
- L. Specified Polymer Horizontal Repair Mortar: All exposed floors shall be leveled, where required, with the specified self-leveling repair topping.
- M. Repair Methods not specified above may be used, subject to acceptance of Architect.

### 3.19 WORK IN CONNECTION WITH OTHER TRADES AND CONTRACTS

- A. Sleeves, pockets, openings, etc., shall be set in the concrete walls and arches as required for the mechanical trades as shown on approved shop drawings; these shall be encased or built into the concrete work and shall be properly placed and secured in position in the forms before concrete is placed.
- B. Provide all chases, pipe slots, etc., required for the mechanical trades (see mechanical drawings), constructed as shown on the approved shop drawings.
- C. Leave temporary access panels where required to install mechanical equipment as required by trade affected. Panels shall be formed with construction joints as specified. Details for such panels shall be submitted to Architect for approval.
- D. Coordinate all penetrations, cutting, and patching with waterproofing contractor.

### 3.20 CUTTING AND PATCHING

- A. Contractor for concrete work shall be responsible for all cutting, removing and patching work where concrete surfaces are not installed within the limits shown on the drawings or specified herein. All such work shall meet with the approval of the Architect/Engineer.
- B. Where cutting and patching is required to accommodate the work of other subcontractors, such cutting shall be done at the expense of said subcontractors but shall be performed by the contractor for concrete work.
- C. The location and extent of cutting in completed concrete work and the patching thereof shall meet with the approval of the Architect/Engineer.

### 3.21 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. The Commissioner will employ a testing laboratory to perform tests and to submit test reports.
- B. Sampling and testing for quality control during placement of concrete may include the following, as directed by Architect.
  - 1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
  - 2. Slump: ASTM C 143; one test at point of discharge for each truck; additional tests when concrete consistency seems to have changed.
  - 3. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; one for each truck of air-entrained concrete.



4. Concrete Temperature: Test hourly when air temperature is 40°F (4°C) and below, and when 80°F (27°C) and above; and each time a set of compression test specimens made.
5. Compression Test Specimen: ASTM C 31; one set of 5 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
6. Compressive Strength Tests: ASTM C 39; one set for each day's pour exceeding 25 cu. yds. plus additional sets for each 50 cu. yds. over and above the first 25 cu. yds. of each concrete class placed in any one day; one specimens tested at 7 days, three specimens tested at 28 days, and one specimens retained in reserve for later testing if required.
  - a. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
  - b. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
  - c. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.
7. Test results will be reported in writing to Architect, Structural Engineer and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.
  - a. Non-Compliance: All test reports indicating non-compliance shall be faxed immediately to all parties on the test report distribution list and the hard copies submitted on different colored paper.
  - b. Nondestructive Testing: Windsor probes, sonoscope, or other non-destructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
8. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests when unacceptable concrete is verified.

END OF SECTION

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**SECTION 033100**

**CAST-IN-PLACE CONCRETE-DIESEL FUEL SYSTEM**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, 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, for the following:
  - 1. All concrete work.

**1.3 DEFINITIONS**

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

**1.4 SUBMITTALS**

- A. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
  - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- B. 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.
- C. Material Certificates: For each of the following, signed by manufacturers:
  - 1. Admixtures.
  - 2. Curing compounds.
- D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

**1.5 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 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."
- C. 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.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."
- E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
  - 1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
  - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures. The Contractor shall be responsible for, and bear all costs associated with the filing and securing approvals, if any, for Form TR3: Technical Report Concrete Design Mix, including, but not limited to, engaging the services of a New York City licensed Concrete Testing Lab for the review and approval of concrete design mix, testing, signatures and professional seals, etc., compliant with NYC Department of Buildings requirements, for each concrete design mix.
- G. Preinstallation Conference: Conduct conference at Project site.
  - 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. Concrete subcontractor.

**1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

## **PART 2 - PRODUCTS**

### **2.1 FORM-FACING MATERIALS**

- A. Smooth-Formed Finished Concrete: Form-facing panels that will 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.
- 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. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
  - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
  - 1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
  - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.

### **2.2 STEEL REINFORCEMENT**

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Plain-Steel Wire: ASTM A 82/A 82M, .
- C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

### **2.3 REINFORCEMENT ACCESSORIES**

- A. 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.

## **2.4 CONCRETE MATERIALS**

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
  - 1. Portland Cement: ASTM C 150, Type I or Type III, gray.
    - a. Fly Ash: ASTM C 618, Class C.
    - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. 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: 1 inch (25 mm) nominal.
  - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.

## **2.5 ADMIXTURES**

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will 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. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
  - 3. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.

## **2.6 CURING MATERIALS**

- A. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- B. Water: Potable.
- C. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating.
  - 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. BASF Construction Chemicals - Building Systems; Kure-N-Seal WB.
    - b. ChemMasters; Safe-Cure & Seal 20.
    - c. Conspec by Dayton Superior; Cure and Seal WB.
    - d. Euclid Chemical Company (The), an RPM company; Aqua Cure VOX; Clearseal WB 150.
    - e. Lambert Corporation; Glazecote Sealer-20.

- f. L&M Construction Chemicals, Inc.; Dress & Seal WB.
- g. Nox-Crete Products Group; Cure & Seal 150E.
- h. Symons by Dayton Superior; Cure & Seal 18 Percent E.

## 2.7 RELATED MATERIALS

- A. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.
- B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

## 2.8 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, 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. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

## 2.9 CONCRETE MIXTURES, GENERAL

- A. 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.
  - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
  - 1. Use water-reducing or high-range water-reducing admixture in concrete, as required, for placement and workability.
  - 2. 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 water-cementitious materials ratio below 0.50.

## 2.10 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. All Concrete: Proportion normal-weight concrete mixture as follows:
  - 1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
  - 2. Minimum Cementitious Materials Content: 540 lb/cu. yd. (320 kg/cu. m).
  - 3. Maximum Water-Cementitious Materials Ratio: 0.45.
  - 4. Slump Limit: 5 inches (125 mm) 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch

5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch (25-mm) nominal maximum aggregate size for all concrete permanently exposed to the weather

## 2.11 FABRICATING REINFORCEMENT

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

## 2.12 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
  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.

## PART 3 - EXECUTION

### 3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
  1. Class B, 1/4 inch (6 mm) for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate 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.
- F. 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.
- G. 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.
- H. Chamfer exterior corners and edges of permanently exposed concrete.



- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

### 3.2 EMBEDDED ITEMS

- 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's "Code of Standard Practice for Steel Buildings and Bridges."

### 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 beams, slabs, and other structural elements that supports 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 will not be 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 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would 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.

### 3.5 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. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
  5. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

### 3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- 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.
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 will be 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 to not 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.
  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.
- F. 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.
  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.
- G. Hot-Weather Placement: Comply with ACI 301 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.

**3.7 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.

**3.8 FINISHING FLOORS AND SLABS**

- A. Broom Finish: Apply a broom finish to exterior concrete.
  - 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.

**3.9 MISCELLANEOUS CONCRETE ITEMS**

- 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.

**3.10 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 for hot-weather protection during curing.
- B. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- C. 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. 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 unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project or surfaces that are to receive concrete dye. Moisture curing may be required for surfaces to receive dye.
- b. Slabs-on-grade that are to receive wood flooring must receive curing compound and not be moist cured.

### 3.11 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 six months. 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 joint 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.

### 3.12 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 one part portland cement to two and one-half 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 will match 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.

### 3.13 FIELD QUALITY CONTROL

- A. **Testing and Inspecting:** Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

**B. Inspections:**

1. Steel reinforcement placement.
2. Verification of use of required design mixture.
3. Concrete placement, including conveying and depositing.
4. Curing procedures and maintenance of curing temperature.

**C. Concrete Tests:** Testing of composite samples of fresh concrete obtained according to ASTM C 172 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. 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. 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 80 deg F (27 deg C) and above, and one test for each composite sample.
4. 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.
5. 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.
6. 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.
7. 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

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**SECTION 035416**

**CEMENT LEVELING COMPOUND**

**PART 1 GENERAL**

**1.1 DESCRIPTION**

- 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 cement leveling compound as shown on the drawings and/or specified herein, including but not necessarily limited to the following:
  - 1. Self-leveling cement compound applied over existing concrete substrates.

**1.3 QUALITY ASSURANCE**

- A. Applicator: Company specializing in performing the work of this Section with a minimum of 3 years' experience and approved by the manufacturer of the product used.

**1.4 SUBMITTALS**

- A. Submit catalog information and product data for material to be used.
- B. Submit approval letter as required by Article 3.1, para. B. herein.

**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.

**1.6 REGULATORY REQUIREMENTS**

- A. Conform to New York City Building Code for combustibility or flame spread requirements.

**1.7 MOCK-UP**

- A. Construct a mock-up of underlayment material, 8 feet long by 8 feet wide.
- B. Locate where directed by the Commissioner.

- C. Approved mock-up may remain as part of the Work.

## **1.8 JOB REQUIREMENTS**

- A. Do not install underlayment until floor penetrations and peripheral work are complete.
- B. Maintain minimum ambient temperatures of 50 degrees F. 24 hours before, during, and 72 hours after installation of underlayment.
- C. During the curing process, ventilate spaces to remove excess moisture and until underlayment is dry, allow a minimum of seven (7) days.

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURER**

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

### **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 Commissioner 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 thickness indicated.
- C. Place before partition installation.
- D. Transition to existing floor; use stiff mix to slope to align with existing adjacent floor.

#### **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.

**END OF SECTION**

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**SECTION 042000**

**UNIT MASONRY - M&R BUILDING**

**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 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. Metal joint reinforcing, anchors, ties, closures, weeps, and related accessories for masonry.
  - 3. Control joints in masonry, filled with joint fillers.
  - 4. Flashing of masonry.
  - 5. Chases, recesses, pockets and openings in masonry as required for installation of work by others.
  - 6. 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.
  - 7. Grouting in of metal items built into masonry work.
  - 8. Protection, pointing and cleaning of masonry.

**1.3 RELATED SECTIONS**

- A. Cast-in-Place Concrete - Section 033000.
- B. Sheet Metal Flashing - Section 076200.
- C. Joint Sealers - Section 079200.

**1.4 SUBMITTALS**

- A. Shop Drawings: Submit for:
  - 1. Anchoring details.
  - 2. Control joint locations and details.

3. Flashing.
- B. Samples (Submit 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.
  4. Flashing, including splice sample, 12" long.
  5. Mortar color, 12" long cured sample.
- C. Manufacturer's Literature: Submit technical and installation information for:
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 sample of concrete block may be tested by an Independent Testing Laboratory retained by the City of New York according to the requirements of ASTM C 140.
- D. Construction Procedures: Submit proposed procedures and materials for cleaning masonry work; including certification that cleaner will not adversely affect stone, gaskets, sealants, etc.

**1.5 QUALITY ASSURANCE**

- A. Work of this Section shall conform to the requirements of the following:
1. 2008 ACI 530/ASCE 5/TMS 402 Building Code Requirements for Masonry Structures.
  2. 2008 ACI 530-1/ASCE 6/TMS 602 Specifications for Masonry Structures.
- B. 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 Commissioner and City of New York. 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.

**1.6 PRODUCT HANDLING**

- A. General: Deliver, store, handle and protect all materials from damage, moisture, dirt and intrusion of foreign matter. Store all masonry units and mortar materials on raised platforms and under ventilated and 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.
- B. Masonry Units: Pack, deliver and store to prevent breakage, cracking, chipping, spalling or other damage. Store, protect and ventilate units at project site.
- C. Aggregate: Store with provisions for good drainage.
- D. Reinforcement and Anchors: 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.

**1.7 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.
  3. For controlled inspection of masonry construction refer to drawings.
- B. Fire rated masonry partitions shall have MEA or BSA number.

## **HARPER STREET YARD**

FMS ID# HWQF027C

- C. Conform to New York City Local Law 17-95 for Seismic Requirements.

### **1.8 JOB CONDITIONS**

- A. 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 Institute of America (BIA). No anti-freeze admixtures are permitted.
- B. 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.
- C. 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.
- 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.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- A. Standard Concrete Block
  - 1. Portland cement, ASTM C 150, Type 1, one source.
  - 2. Aggregates, ASTM C 331, lightweight expanded shale, clay or slate aggregates, manufactured by the rotary kiln process equal to "Solite," "Norlite," "Haydite" or approved equal.
    - a. All block shall be from one aggregate type and from one manufacturer.
  - 3. Concrete Masonry Units: Load bearing lightweight aggregate concrete masonry units conforming to the requirements of ASTM C 90.
    - a. Block for rated walls shall be solid units.
    - b. All other block shall be hollow 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 five (105) 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. Masonry Joint Reinforcement for Exterior Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.
  - a. Reinforcing assembly shall be hot dip galvanized steel finish conforming to ASTM A 153 with zinc coating of 1.5 oz. of zinc per sq. ft., after fabrication.
2. 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.
3. Wire used in assemblies noted above shall be cold drawn steel wire conforming to ASTM A 82.
4. Approved Joint Reinforcing Manufacturers
  - a. Hohmann & Barnard
  - b. Dur-O-Wal

## **HARPER STREET YARD**

FMS ID# HWQF027C

- c. Heckmann Building Products
- d. National Wire Products Industries, Inc.
- e. or approved equal

### **C. Anchors and Ties**

1. Dovetail Anchor Slots: Galvanized steel equal to No. 305 anchor slot made by Hohmann & Barnard or approved equal by manufacturer noted above.
2. Flexible Metal Ties for Dovetail Anchor Slots: Galvanized steel, 16 gauge by 1" wide.
3. Wire Mesh: Galvanized sixteen (16) gauge steel wire, 1/4" square mesh, width 1/2" less than wall thickness, by length to suit condition.
4. For anchoring masonry to structural steel, provide hot-dip galvanized steel anchors as listed made by Hohmann & Barnard or approved equal by manufacturer noted above. 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.
5. For anchoring CMU interior partitions to underside of steel beams, provide hot-dip galvanized steel tube anchor equal to No. PTA-420 made by Hohmann & Barnard or approved equal by manufacturer noted above.
6. 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

### **D. Reinforcing Bars and Rods: ASTM A 615, Grade 60. See Drawings for size.**

### **E. Control 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 walls.
    - 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. Recess joint filler and install backer rod and sealant as per drawings and Section 079200 of these specifications.

## 2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type 1, standard color, one source.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Sand: Clean, washed, buff colored sand, graded per ASTM C 144.
- D. Water: Clean, fresh and suitable for drinking.

## 2.3 MORTAR MIX

- A. Exterior Block Construction: Provide Portland cement/lime mortar as noted above conforming to ASTM C 270, Type N.
- B. Interior Masonry Construction: For non-load-bearing conditions, provide Portland cement/lime mortar conforming to ASTM C 270, Type N; for load-bearing conditions, mortar shall conform to ASTM C 270, Type M.
- C. Reinforced Concrete Block: Provide Portland cement/lime mortar conforming to ASTM C 270, Type S.
- D. Grout for Unit Masonry: Comply with ASTM C 476 for grout for use in construction of unit masonry. Use grout of consistency (fine or coarse) at time of placement which will completely fill all spaces intended to receive grout.
- 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.

**F. Admixtures**

1. No air-entraining admixtures or cementitious materials containing air-entraining admixtures shall be used in the mortar.
2. No antifreeze compounds or other substances shall be used in the mortar to lower the freezing point.
3. Calcium chloride or admixtures containing calcium chloride shall not be used in mortar.

**2.4 MASONRY ACCESSORIES**

- A. Neoprene Joint Filler: Provide closed cell neoprene, Type NN-1, conforming to ASTM D 1056, Grade 1, high performance, as manufactured by Williams Products Inc., or equal made by D. S. Brown, Norton, or approved equal.
- B. Weep Holes: Provide clear plastic weep holes 3/8" wide and 1-1/2" high by four (4) inches long, where noted.
- C. Single-Wythe CMU Flashing System: System of CMU cell flashing pans and interlocking CMU web covers made from high-density polyethylene incorporating chemical stabilizers that prevent UV degradation. Cell flashing pans have integral weep spouts that are designed to be built into mortar bed joints and weep collected moisture to the exterior of CMU walls and that extend into the cell to prevent clogging with mortar.
  1. Provide "Blok-Flash" as manufactured by Mortar Net USA, Ltd. or approved equal.

**PART 3 EXECUTION**

**3.1 SURFACE CONDITIONS**

- A. Inspection
  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.
- B. Discrepancies: In the event of discrepancy, immediately notify the Commissioner in writing. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved. Starting of work by the Contractor means acceptance by the Contractor of the substrate.

**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 INSTALLATION

#### A. General

1. Do not wet concrete block units.
2. 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.
3. Build chases and recesses as shown or required for the work of other trades.
4. 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.
5. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to properly locate openings, movement type joints, returns and off-sets. Avoid the use of less than half size units at corners, jambs and wherever possible.
6. Lay up walls plumb and true with courses level, accurately spaced and coordinated with other work.
7. 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.
8. 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 Commissioner.

#### B. Mortar Bedding and Jointing

1. Lay concrete masonry units with full mortar coverage on horizontal and vertical face shells. 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.
2. Lay masonry walls with 3/8" joints unless otherwise shown on drawings.

3. Tool exposed joints slightly concave. Concealed joints shall be struck flush.
  4. 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.
- C. Stopping and Resuming Work: Rake back 1/2 unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if required) and remove loose masonry units and mortar prior to laying fresh masonry.
- D. Built-In Work
1. 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.
  2. 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.
  3. Grout under lintels, bearing plates, and steel bearing on masonry with solid bed grout.
  4. 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 air tight and prevent air leakage.
  5. 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.
  6. Fill vertical cells of masonry units solid with mortar on each side of door frames to sixteen (16) inches beyond.
  7. 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.
  8. Place wire mesh in horizontal joint below masonry unit cells to be filled with mortar, to prevent mortar from dropping into unfilled cells below.

9. 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.

**E. Cutting and Patching**

1. All exposed masonry which requires cutting or fitting shall be cut accurately to size with motorized carborundum or diamond saw, producing cut edges.
2. Holes made in exposed masonry units for attachment of handrail brackets and similar items shall be neatly drilled to proper size.
3. All masonry which requires patching in exposed work, if approved by Commissioner, shall be patched neatly with mortar to match appearance of masonry as closely as possible and to the Commissioner's satisfaction. Rake back joints and use pointing mortar to match as required.

**F. Solid Wall Construction**

1. Fill the vertical longitudinal joint between wythes solidly with mortar by parging the in-place wythe and shoving units into the parging.
2. Tie wythes with continuous horizontal reinforcement embedded in mortar joints sixteen (16) inches o.c. vertically.

**G. Interior Block Partitions**

1. 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 Article 2.4 herein. Fasten to structure at top of partition using steel angles as specified herein.
2. 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.

3. 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.
4. Corners
  - a. Provide interlocking masonry unit bond in each course at corners.
  - b. Provide continuity at corners with prefabricated "L" reinforcement units, in addition to masonry bonding.
5. 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.

**H. Ties and Anchors for Masonry Construction**

1. 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.
2. Anchoring Masonry to Structure: Provide an open space not less than 1/2" in width between masonry and structural member, unless otherwise shown. Keep open space free of mortar or other rigid materials.

**I. Control Joints**

1. Provide control and isolation joints in masonry as shown. Build in related items as the masonry work progresses.
2. 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.



- J. Lintels: For concrete block walls, use specially formed U-shaped concrete block lintel units with reinforcing bars in accordance with the following table, filled with grout.

Number and Size of Reinforcing Bars Required at Concrete Block Lintels		
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

### 3.4 FLASHING/WEEP HOLES

- A. General: Install embedded flashing and weep holes in masonry at relieving angles, shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, and where indicated. Space weeps 16" o.c. unless otherwise shown on drawings.
- B. Prepare masonry surfaces so that they are smooth and free from projections that could puncture flashing.
- C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.
- D. Where flashing is penetrated by anchors, patch flashings at penetration using adhesive and mastic recommended by the manufacturer to insure watertight seal.
- E. Install flashing in accordance with manufacturer's instructions, using adhesive, primer, thinner, cleaner and mastic as recommended by flashing manufacturer.

### 3.5 CLEANING, PROTECTION, ADJUSTMENT

- 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.

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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 Commissioner.
  5. Damaged masonry units shall be replaced to satisfaction of the Commissioner.
  6. Exterior masonry walls shall be draped with waterproof covering until copings are in place, to prevent water penetration in cavity.
- B. Cleaning of Masonry: Upon completion, all exposed masonry shall be thoroughly cleaned following recommendations of the BMI 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 Commissioner. No further cleaning work may proceed until the sample area has been approved by the Commissioner, 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.
- C. Pointing: Point any defective joint with mortar identical with that specified for that joint.

END OF SECTION

**SECTION 042100**

**MASONRY UNITS-DIESEL FUEL SYSTEM**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

The Contractor shall furnish all labor, materials, tools, and equipment, and shall complete the masonry unit work, as required by the Contract Documents.

**1.02 APPLICABLE STANDARDS**

The publications are referenced by basic designation only and shall be the latest published version.

- American Society for Testing and Materials (ASTM)

ASTM C90	Specification for Load-Bearing Concrete Masonry Units
ASTM C91	Specification for Masonry Cement
ASTM C144	Specification for Aggregate for Masonry Mortar
ASTM C150	Specification for Portland Cement
ASTM C207	Specification for Hydrated Lime for Masonry Purposes
ASTM C270	Specification for Mortar for Unit Masonry

**1.03 SUBMITTALS**

The Contractor shall submit manufacturer's certification to the Construction Manager for review and approval, stating that the proposed masonry units materials are in conformance with the requirements of this Specification.

**PART 2 - PRODUCTS**

**2.01 MATERIALS**

- A. Concrete Blocks: Concrete blocks shall be as shown on the Contract Drawings, light gray or neutral color, and shall conform to the requirements of ASTM C90 or shall be New York City-approved load-bearing concrete blocks.
- B. Mortar: Mortar shall be TYPE "M" having 2,500 psi average strength at 28 days and shall conform to ASTM C270.
- C. Cement: Cement shall be Type I (or Type II) Portland Cement conforming to ASTM C150. Masonry cement shall conform to ASTM C91.
- D. Aggregate: Aggregate (sand) shall be clean, sharp, and well-graded, and free from injurious amounts of dust, lumps, shale, alkali, surface coatings, and organic matter. Aggregate shall conform to ASTM C144.

- E. Lime: Hydrated lime shall conform to ASTM C207, Type S.
- F. Admixtures: Admixtures will not be permitted unless substantiating data is submitted and accepted by the Construction Manager. Antifreeze compounds or calcium chloride shall not be used.
- G. Water: Water shall be free from deleterious amounts of acids, alkalies, or organic materials.
- H. Concrete: Concrete shall conform to the requirements of SECTION: CAST IN-PLACE STRUCTURAL CONCRETE.
- I. Reinforcing Steel: Reinforcing steel shall conform to the requirements of SECTION: CONCRETE REINFORCEMENT.

### **PART 3 - EXECUTION**

#### **3.01 GENERAL**

- A. The Contractor shall lay all concrete blocks, plumb, level, and true to the lines and dimensions shown on the Contract Drawings. Chipped or broken concrete blocks shall not be permitted. If any such blocks are placed in the finished load-bearing piers, the Construction Manager may require their removal and replacement with new units at no additional cost to the City.
- B. PLACEMENT
  - 1. All concrete blocks shall be placed with full mortar coverage on horizontal face shells.
  - 2. All vertical cores shall be aligned to maintain a clear, unobstructed system of flues

#### **3.02 MORTAR**

- A. Mortar shall be mixed by placing  $\frac{1}{2}$  of the water and sand in the operating mixer, then adding the cement, lime (as required), and the remainder of the sand and water. After all ingredients are in the batch mixer, they shall be mixed mechanically for at least 3 minutes but not less than 5 minutes. Hand mixing shall not be allowed unless specifically permitted by the Construction Manager.
- B. Mortar should be retempered with water as required to maintain high plasticity. Retempering on mortar beds shall be done only by adding water within a basin formed with the mortar and the mortar reworked into the water. Any mortar which is unused after 1-1/2 hours from the initial mixing time shall not be used.

**3.03 REINFORCEMENT**

Reinforcement shall be installed in the concrete blocks' vertical cores as shown on the Contract Drawings or as directed by the Construction Manager and shall conform to the requirements of SECTION: CONCRETE REINFORCEMENT.

**3.05 FILLING THE VERTICAL CORES**

All vertical cores shall be filled with concrete as shown on the Contract Drawings. Concrete shall be rodded to eliminate void space.

**END OF SECTION**

**NO TEXT ON THIS PAGE**

**SECTION 049000**

**MASONRY RESTORATION AND CLEANING**

**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 masonry restoration and cleaning as shown on the drawings and/or specified herein, including, but not limited to, the following:
  - 1. Cleaning existing face brick walls and removing existing paint.
  - 2. Repointing cracks at the end brick walls of the M & R building.
  - 3. Replacing existing face brick.

**1.3 QUALITY ASSURANCE**

- A. Field-Constructed Mock-Ups: Prior to start of general masonry restoration, prepare the following sample panels on the building where directed by Commissioner. Obtain Commissioner's acceptance of visual qualities before proceeding with the work. Retain acceptable panels in undisturbed condition, suitably marked, during construction as a standard for judging completed work.
  - 1. Cleaning: Demonstrate materials and methods to be used for cleaning each type of masonry surface and condition on sample panels of approximately 25 sq. ft. in area.
    - a. Test adjacent non-masonry materials for possible reaction with cleaning materials.
    - b. Allow waiting period not less than seven (7) calendar days, after completion of sample cleaning to permit study of sample panels for negative reactions.

**1.4 SUBMITTALS**

- A. Product Data: Submit manufacturers' technical data for each product indicated including recommendations for their application and use and VOC compliance. Include test reports and certifications substantiating that products comply with requirements.

- B. Restoration Program: Submit written program for each phase of restoration process including protection of surrounding materials on building and site during operations. Describe in detail materials, methods and equipment to be used for each phase of restoration work.

#### **1.5 DELIVERY, STORAGE AND HANDLING**

- A. Carefully pack, handle, and ship masonry units and accessories strapped together in suitable packs or pallets or in heavy cartons. Unload and handle to prevent chipping and breakage.
- B. Deliver other materials to site in manufacturer's original and unopened containers and packaging, bearing labels as to type and names of products and manufacturers.
- C. Protect masonry restoration materials during storage and construction from wetting by rain, snow or ground water, and from staining or intermixture with earth or other types of materials.
- D. Protect grout, mortar and other materials from deterioration by moisture and temperature. Store in a dry location or in waterproof containers. Keep containers tightly closed and away from open flames. Protect liquid components from freezing. Comply with manufacturer's recommendations for minimum and maximum temperature requirements for storage.

#### **1.6 PROJECT CONDITIONS**

- A. Clean masonry surfaces only when air temperatures are 40 deg. F. and above and will remain so until masonry has dried out, but for not less than seven (7) days after completion of cleaning.

### **PART 2 PRODUCTS**

#### **2.1 MASONRY MATERIALS**

- A. Provide face brick conforming to ASTM C 216, Grade SW, Type FBX; with colors, color variation within units, surface texture, size, and shape to match existing brickwork.
- B. For mortar materials, conform to the following requirements:
  - 1. Portland Cement: ASTM C 150, Type 1, standard color, one source.
  - 2. Hydrated Lime: ASTM C 207, Type S.
  - 3. Sand: Clean, washed, buff colored sand, graded per ASTM C 144.
  - 4. Water: Clean, fresh and suitable for drinking.



C. Mortar Mix: ASTM C 270, Type N, cement/lime mortar.

1. Color of mortar must conform to Commissioner's approved sample.

## 2.2 CLEANING MATERIALS AND EQUIPMENT

A. Water for Cleaning: Clean, potable, free of oils, acids, alkalis, salts, and organic matter.

B. Solvent-Type Paint Remover: Manufacturer's standard water-rinsable, solvent-type gel formulation for removing paint coatings from masonry. Provide "Sure Klean Fast Acting Stripper" by ProSoCo or equivalent product of Diedrich Technologies, Price Research, Ltd., or approved equal.

C. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film forming, strippable masking material for protecting glass, metal and polished stone surfaces from damaging effect of acidic and alkaline masonry cleaners.

1. Products: Subject to compliance with requirements provide one of the following:

- a. "Diedrich Acid Guard," Diedrich Technologies
- b. "Price Mask," Price Research, Ltd.
- c. "Sure Klean Acid Stop," ProSoCo, Inc.
- d. or approved equal

D. Spray Equipment: Provide equipment for controlled spray application of water and chemical cleaners, at rates required by the manufacturer, measured at spray tip, and for volume.

1. For spray application of chemical cleaners provide low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray-tip.
2. For spray application of water provide fan-shaped spray-tip which disperses water at angle of not less than 15 degrees.

## 2.3 MORTAR MIXES

A. Measuring and Mixing: Measure cementitious and aggregate material in a dry condition by volume or equivalent weight. Do not measure by shovel, use known measure. Mix materials in a clean mechanical batch mixer.

1. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix which will retain its form when pressed into a ball. Maintain mortar in this dampened condition for 1-to-2 hours. Add remaining water in small portions until mortar of desired consistency is reached. Use mortar within thirty (30) minutes of final mixing; do not retemper or use partially hardened material.

- B. Colored Mortar: Produce mortar of color required by use of selected coloring agent.
- C. Do not use admixtures of any kind in mortar, other than colorant.
- D. Mortar Proportions
  - 1. Pointing Mortar for Brick: One part white Portland cement, 2 parts lime and 6 parts colored mortar aggregate. Add colored mortar pigment to product mortar colors required to match.
  - 2. Rebuilding Mortar: Comply with ASTM C 270, Proportion Specification, Type N, with cementitious material content limited to Portland cement-lime and coloring agent.

### **PART 3 EXECUTION**

#### **3.1 INSPECTION**

- A. Examine the areas and conditions where masonry restoration and cleaning are to be performed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected by the Contractor in a manner acceptable to the Commissioner.

#### **3.2 PROTECTION**

- A. General: Comply with recommendations of manufacturers of chemical cleaners for protecting building surfaces against damage from exposure to their products.
- B. Protect persons, motor vehicles, surrounding surfaces of building whose masonry surfaces are being restored, building site, and surrounding buildings from injury resulting from masonry restoration work.
  - 1. Prevent chemical cleaning solutions from coming into contact with pedestrians, motor vehicles, landscaping, buildings and other surfaces which could be injured by such contact.
  - 2. Do not clean masonry during winds of sufficient force to spread cleaning solutions to unprotected surfaces.
  - 3. Dispose of run-off from cleaning operations by legal means and in manner which prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.
  - 4. Erect temporary protection covers over pedestrian walkways and at points of entrance and exit for persons and vehicles which must remain in operation during course of masonry restoration work.

- C. Protect glass, unpainted metal trim and polished stone from contact with acidic chemical cleaners by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape. Apply masking agent to comply with manufacturer's recommendations. Do not apply liquid masking agent to painted or porous surfaces.

### **3.3 EXISTING MASONRY PAINT REMOVAL**

- A. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other.
- B. Use only those cleaning methods indicated for each masonry material and location.
- C. Perform each cleaning method indicated in a manner which results in uniform coverage of all surfaces, including corners, moldings, interstices and which produces an even effect without streaking or damage to masonry surfaces.
- D. Exterior Application
  - 1. Do not dilute or alter cleaning agent.
  - 2. Apply a thick coating of Fast Acting Stripper to dry surface.
  - 3. Let stripper dwell 15-30 minutes or until coating "lifts" or shows signs of dissolving. Periodic agitation with a stiff bristle brush improves penetration. Provide multiple applications/increased dwell time as required to remove all paint and graffiti.
  - 4. Remove stripper and residue with pressure – water rinse. Heated water (150 deg. F. – 180 Deg. F.) improves stripping efficiency.
  - 5. The best combination of rinsing pressure and water volume is provided by masonry washing equipment generating 400-1000 psi with a water flow rate of 6-8 gallons per minute delivered through a 15-45 degree fan spray tip. Equipment shall be adjustable to reduce water flow rate and rinsing pressure as required for controlled cleaning of more sensitive surfaces.
  - 6. Thoroughly clean with the appropriate cleaning product as recommended by stripper manufacturer..

### **3.4 BRICK REMOVAL AND REBUILDING**

- A. Brick Removal
  - 1. Carefully remove by hand any brick which are damaged, spalled or deteriorated. Cut out full units from joint to joint and in manner to permit replacement with full size units.
  - 2. Support and protect masonry indicated to remain which surrounds removal area.

3. Salvage as many whole, undamaged bricks as possible.
4. Remove mortar, loose particles and soil from salvaged brick by cleaning with brushes and water. Store brick for reuse.
5. Clean remaining brick at edges of removal areas by removing mortar, dust, and loose debris in preparation for rebuilding.

**B. Brick Rebuilding**

1. Install new or salvaged brick to replace removed brick. Fit replacement units into bonding and coursing pattern of existing brick. If cutting is required use motor driven saw designed to cut masonry with clean, sharp unchipped edges.
2. Lay replacement brick with completely filled bed, head and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet clay brick which have ASTM C 67 initial rates of absorption (suction) of more than 30 grams per 30 sq. in. per minute. Use wetting methods which ensure that units are nearly saturated but surface dry when laid. Maintain joint width for replacement units to match existing.
3. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.

**3.5 REPOINTING EXISTING MASONRY**

**A. Joint Raking**

1. 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, unweathered mortar.
2. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum or flush joints to remove dirt and loose debris.
3. Do not spall edges of masonry units or widen joints. Replace any masonry units which become damaged.
  - a. Cut out old mortar by hand with chisel and mallet.
  - b. Power operated rotary hand saws and grinders will be permitted but only on specific written approval of Commissioner based on submission by Contractor of a satisfactory quality control program and demonstrated ability of operators to use tools without damage to masonry. Quality control program shall include provisions for supervising performance and preventing damage due to worker fatigue.

**B. Joint Pointing**

1. Rinse masonry joint surfaces with water to remove any dust and mortar particles. Time application of rinsing so that, at time of pointing, excess water has evaporated or run off, and joint surfaces are damp but free of standing water.
2. Apply first layer of pointing mortar to areas where existing mortar was removed to depths greater than surrounding areas. Apply 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.
3. After joints have been filled to a uniform depth, place remaining pointing mortar in three (3) layers with each of first and second layers filling approximately 2/5 of joint depth and third layer the remaining 1/5. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing bricks have rounded edges recess final layer slightly from face. Take care not to spread mortar over edges onto exposed masonry surfaces, or to featheredge mortar.
4. When mortar is thumbprint hard, tool joints to match original appearance of joints, unless otherwise indicated. Remove excess mortar from edge of joint by brushing.
5. Cure mortar by maintaining in a damp condition for not less than seventy-two (72) hours.
6. Where repointing work precedes cleaning of existing masonry allow mortar to harden not less than thirty (30) days before beginning cleaning work.

**END OF SECTION**

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**SECTION 050500**

**MISCELLANEOUS METALS-DIESEL FUEL SYSTEM**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

The Contractor shall furnish all labor, materials, tools, and equipment, and complete the miscellaneous metals work, as required by the Contract Documents. Pipe bollards on the diesel dispensing island shall be stainless steel filled with concrete. Stainless steel forms shall be used surrounding the diesel dispenser island.

**1.02 SUBMITTALS**

The following items shall be submitted to the Construction Manager for approval in accordance with SECTION: SUBMITTALS.

- A. Product specifications, installation instructions, and other data necessary to determine compliance with the requirements specified herein and with the referenced standards.
- B. Shop drawing: Shop drawings showing all details (i.e., dimensions, erection details, cuts, copes, connections, holes, threaded fasteners, and welds) for fabrication and installation of all miscellaneous metal items.
- C. Certificates of Compliance for all miscellaneous metal items specified herein.

**1.03 APPLICABLE STANDARDS**

The publications are referenced by basic designation and shall be the latest published version.

- American Society for Testing and Materials (ASTM)
  - ASTM A27      Specifications for Steel Castings, Carbon, for General Applications
  - ASTM A36      Specifications for Structural Steel
  - ASTM A47      Specifications for Ferritic Malleable Iron Castings
  - ASTM A48      Specifications for Gray Iron Castings
  - ASTM A53      Specifications for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
  - ASTM A570      Specifications for Steel, Sheet and Strip, Carbon, Hot-Rolled Structural Quality
- American Welding Society (AWS)

## **PART 2 - MATERIALS**

- A. Steel - Steel for miscellaneous metals shall conform to ASTM A36.
- B. Steel Pipe - Steel pipe shall conform to ASTM A53 for welded pipe.
- C. Fasteners - Approved anchor bolts or expansion bolts, as directed by the Construction Manager, shall be used for securing miscellaneous metals to masonry. Anchor bolts, in general, shall be used for securing railings to copings, floors, and stairs. Where it is necessary to use expansion bolts, the holes in the masonry shall be drilled to the exact size for the bolts or sleeves, and no packing shall be used. Expansion bolts shall be of a type, diameter, and length as approved by the Project Manager.
- D. Stainless Steel Pipe Bollards – Pipe bollards shall be constructed of grade 316 polished stainless steel, 0.25-inches thick, equipped with screw on cap and filled with concrete.
- E. Stainless Steel Island Forms – Island forms shall be a minimum 16-inches high, constructed of grade 304 polished 12-gauge stainless steel.

## **PART 3 - EXECUTION**

### **3.01 ASSEMBLY**

All work, to the extend practical, shall be built and assembled in the shop, and shall conform to the actual measurements taken by the Contractor at the site where the work is to be installed. All work shall be plumb, true, and in conformity with the details shown on the Contract Drawings.

### **3.02 CONSTRUCTION**

- A. Miscellaneous Architectural Steel and Iron
  - 1. Miscellaneous architectural steel and iron work, such as steel ladders, steel supports, checkered steel plate covers with their continuous steel angle frames, cable pulling eyes, pipe barriers with chains, swing bars, services boxes, and steel manhole shall be provided where indicated on the Contract Drawings.
  - 2. Miscellaneous steel shapes necessary to complete the work under this Contract shall be furnished and installed by the Contractor.
- B. All miscellaneous steel, unless indicated on the Contract Drawings, shall be galvanized in accordance SECTION: GALVANIZING.

### **3.03. WELDING**

- A. All containment dikes, unless otherwise shown on the Contract Drawings, shall be seam-welded.



- B. \*Welds shall be cleaned by removing all scale, slag, weld spatter, or burrs. The Contractor shall ensure that all sharp or rough-welded surfaces are removed on both the inside and outside of the tanks. Generally all surfaces, especially seam welds, corners, crevices, etc., shall be left suitable for application of special coatings and finishes. All welds shall be ground to a smooth contour. Welding shall be performed by the accepted methods required by the AWS Code. All welds shall be continuous and full penetration overall.
- C. Reinforcement, such as stiffeners and supports, shall be tack welded to the dikes. Skip or tack welding is not acceptable for any other mechanisms, components, or apparatus to any dikes. The Contractor shall be required to make all such seams and joints continuous fillets as recommended in the AWS Standards.
- D. Welding of joints for wall shell plates shall be seam welds and continuous over all horizontal and vertical seams.

END OF SECTION

**NO TEXT ON THIS PAGE**

SECTION 050513

GALVANIZING

PART 1 - GENERAL

1.01 SCOPE OF WORK

The Contractor shall furnish all labor, materials, tools, and equipment, and complete the galvanizing work as required by the Contract Documents.

1.02 APPLICABLE STANDARDS

The publications are referenced by basic designation and shall be the latest published version.

- American Society for Testing and Materials (ASTM)

ASTM A 123	Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153	Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM B 633	Specification for Electrodeposited Coatings of Zinc on Iron and Steel
ASTM B 696	Specifications for Coatings of Cadmium Mechanically Deposited
ASTM B 766	Specifications for Electrodeposited Coatings of Cadmium

PART 2 - PRODUCTS  
(Not Used)

PART 3 - EXECUTION

3.01 GENERAL

- A. All galvanizing shall be done after the fabrication of parts and in accordance with the relevant ASTM Methods. Before galvanizing, the finished parts shall be pickled, and the scale and adhering impurities removed thoroughly. Pickling shall be performed in properly diluted sulfuric acid, after which the parts shall be thoroughly cleaned in cold running water. Parts shall then be immersed in a solution of either zinc chloride or hydrochloric acid after becoming thoroughly dried, the parts shall be dipped into the zinc bath before corrosion has again started.

- B. Parts to be galvanized shall be coated in accordance with the requirements of ASTM A123 with no less than 2 ounces of zinc per square foot of galvanized surface.
- C. Bolts, lag screws, drive lags, drive spikes, (and similar hardware) shall be galvanized in accordance with the requirements of ASTM A153 for Class C Material (Bolts, Drive Lags and Similar Articles), with not less than 1-1/4 ounces of zinc per square foot of galvanized surface.
- D. For Class C materials (bolts, drive lags and similar articles), any alternate method of galvanizing shall be in accordance with the requirements of ASTM B633 (Type GS).

### 3.02 ELECTROGALVANIZED PROCESS

The "electrogalvanized" process shall be used only where specified herein, where indicated on the Contract Drawings, or where directed by the Construction Manager. The minimum thickness of electrogalvanized coatings on outside surfaces of ferrous materials, other than stainless-steel, shall be 0.00015 inches on malleable iron castings and 0.0005 inches on steel components and shall be in accordance with the requirements of ASTM B633. The electrogalvanized coating shall protect inside surfaces against corrosion.

### 3.03 CADMIUM PLATING

The Construction Manager may approve the substitution of cadmium plating in place of the galvanizing specified above. Cadmium plating shall be an impervious, dense hard, closely adhering coating of commercially pure cadmium at least 0.0006 inches thick and shall be in accordance with the requirements of ASTM B696 and B766.

END OF SECTION

SECTION 051200

STRUCTURAL STEEL FRAMING

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 WORK INCLUDED

- A. Work of this section includes all labor, materials, equipment and services necessary to complete the structural steel work as shown on the drawings and specified herein, including, but not limited to the following:
  - 1. Furnish and deliver for installation by others, anchor bolts, bearing plates and loose lintels with complete instructions and templates to facilitate installation.
  - 2. Furnish and erect all struts, columns, bearing plates, beams, girders, bracing, hangers, posts and all related connections (bolted and welded).
  - 3. Openings (unreinforced and reinforced) in structural steel to accommodate mechanical and electrical work.
  - 4. Shop painting and field touch-up painting.
  - 5. Erection bracing and supports, including steel wedges, shims or nuts required for leveling base plates.
  - 6. Lintels and angles attached to structural steel as shown on drawings.
  - 7. Unless specifically excluded, furnish and install all other items for structural steel work indicated on the drawings, specified, or obviously needed to make the work of this Section complete.

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Installation of anchor bolts furnished under this section
- B. Grout under base and bearing plates
- C. Cast In Place Concrete
- D. Installation of loose lintels furnished under this section
- E. Metal decking
- F. Miscellaneous metal work
- G. Stair framing and hanger
- H. Field painting of structural steel, except as specified herein
- I. Fireproofing systems

1.4 QUALITY ASSURANCE

- A. Except as modified by the City of New York Building Code and by this specification, comply with the applicable provisions and recommendations of the following codes and standards:
  - 1. AISC "Specification for Structural Steel Buildings" latest edition, as amended by RS10-5 of the NYC Building Code.
  - 2. AISC "Code of Standard Practice for Steel Buildings and Bridges" latest edition.
  - 3. AISC "Seismic Provisions for Structural Steel Buildings", latest edition.
  - 4. Industrial Fasteners Institute "Handbook of Bolt and Bolted Joints" latest edition.
  - 5. Research Council on Riveted and Bolted Structural Joints "Specifications for Structural Joints Using ASTM Hi-Strength Bolts, ASTM A141 Rivets and ASTM A307 Unfinished Bolts" latest edition.

6. AISC "Specifications for Structural Joints Using ASTM A325 or A490 Bolts."
  7. ASTM A6/A6M "Standard Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use "
  8. AWS D1.1, "Structural Welding Code" latest edition.
  9. SSPC "SSPC Painting Manual, Volume 2, Systems and Specifications" latest edition.
  10. New York City Building Code.
- B. Qualifications for welding work shall be as follows:
1. Qualify welding procedures and welding operators in accordance with the NYC Building Code and AWS "Standard Qualification Procedure."
  2. Submit certification that all welders to be employed in work are licensed by the NYC Commissioner of Buildings and are AWS qualified. If recertification of welders is required, retesting will be responsibility of structural steel subcontractor.

#### 1.5 SUBMITTALS

- A. Submit shop drawings in accordance with the specifications as follows:
1. Show clearly all work, including relationship of structural steel to the adjacent work of other trades and to significant lines of finishes of other trades.
  2. Do not fabricate or deliver work to the site before shop drawings have been reviewed, approved and returned by the architect.
  3. Prepare shop drawings in conformance with the best standards of the construction industry, and not less complete than indicated by the applicable procedures shown in "Detailing for Steel Construction," latest edition, published by AISC. Prepare shop drawings under the supervision of competent engineering personnel, licensed by the state in which the construction is to take place. During the preparation of shop drawings, and prior to submittal, coordinate and cross check all shop drawings, including those prepared by subcontractors, for compliance with the Contract Documents.
  4. Indicate clearly the size and grade of steel for each component. Identify rolled shapes, tubes and plates by using the standard designations used in "Load and Resistance Factor Design Manual of Steel Construction," Latest Edition, by AISC.
  5. Indicate welds and nondestructive tests by using the symbols conforming to AWS A2.4 "Symbols for Welding and Nondestructive Testing." Where necessary for clarity, indicate welding procedure designations or other data in the tail of the welding symbol.
  6. Show explicitly the type of connection used in each location, the grade, size, and number of bolts; the type, number, position, designation and orientation of each washer; and the size of each hole, whether slotted or round. Ensure that adequate wrench clearance for correct bolt tightening is provided and note special bolt tightening sequences where applicable and necessary.
  7. Show all camber dimensions in the shop drawings. Where specific camber is not shown in the drawings, note on each affected shop drawing that such members are to be fabricated with the natural camber up.
  8. Show holes required for securing work specified in other sections to structural steelwork, as well as all holes required for passage through structural steelwork of work of other trades. Provide field work drawings for all such holes not shown in shop or erection drawings. Addition of, or change in size or location of openings will not be permitted without prior approval.
  9. Make details in such a way as to avoid having steel, connections, bracing, bolts, etc., interfere with architectural details or in any way reduce the areas of shafts, openings, clearances, etc.

10. Detail and schedule cleaning and painting data and requirements, including specific indication of "no-paint" areas.
  11. The use of the engineer's or architect's electronic drawing files as a base for the erection shop drawings will be permitted at the request of the structural steel detailer upon completion and return of the waiver form. The use of the engineer's or architect's electronic drawing files as a base for shop drawing details will be not be permitted. The structural steel detailer will be responsible for compatibility of the files with his hardware or software. The electronic files are not to be considered the contract documents, the design team makes no representation regarding the accuracy or completeness of the electronic files given to the structural steel detailer and their use will be at the structural steel detailers sole risk and without liability to the design team. The structural steel detailer shall remove the project title box and all references to the structural drawings including drawing numbers and structural drawing sections and details. The structural steel detailer shall also remove all reference to work not included in the steel contract. Show clearly the size and location of each member and the erection mark assigned to each member. Show each field connection with all data and details necessary for assembling the structure. Direct special attention to the possible need for special guying, bracing, or shoring to prevent deformation of existing or new structure due to stresses caused by erection procedures and equipment, by construction loadings, and by forces of natural phenomena.
  12. Prepare, keep up-to-date, and submit a complete drawing index cross-referencing each assigned piece mark with the drawing number in which the piece is detailed. Detail drawings submitted without an up-to-date index and the applicable erection drawing(s) showing the location of each piece will be deemed an incomplete submission and will not be accepted as subject to any agreed shop drawing review schedule.
  13. Prepare anchor bolt and base plate erection drawings containing complete location and placing details, including details of all templates. Provide anchor bolt erection drawings to the concrete trade in advance of applicable concrete work and in coordination with concrete construction sequence.
  14. Direct the architect's attention in writing to any proposed deviations from the Contract Documents, prior to the submission of shop drawings showing the proposed deviation. Submit requests for deviations on the structural steel contractor's letterhead. Deviations not identified, or identified only in letters of transmittal or in shop drawings or both, without the required written request, may not be accepted, and shall be sufficient cause for the architect to return each shop drawing containing such deviations without further action. Acceptance of shop drawings containing deviations not detected by the architect during shop drawing review shall not relieve the structural steel contractor from responsibility to conform strictly to the Contract Documents.
  15. Prior to resubmission of shop drawings with additions or corrections, circle and identify all changes. Drawings submitted without each change being clearly identified are subject to return for resubmission.
  16. Prior to making shop drawings for any portion of the work involving alterations to an existing structure, make all necessary field observations, measurements and surveys of existing conditions. If probes are required to accomplish such measurements, give timely notice where probes will be required.
- B. Submit certified copies of each survey conducted by a surveyor licensed by the state in which the construction is to take place and employed by the structural steel contractor. Survey shall show elevations and locations of base plates and anchor bolts to receive

structural steel, and final elevations and locations for major members. Indicate discrepancies between actual installation and Contract Documents.

**C. Reports**

1. Submit certified copies of mill test reports for all steel furnished. Perform mechanical and chemical tests for all material regardless of thickness or use.
2. Submit anchor bolt checking certification as required.
3. Submit qualification certificates of all welders who will perform work on the project.
4. Submit survey of erected steelwork as required.

**1.6 DELIVERY, STORAGE AND HANDLING**

- A. Deliver materials to site at such intervals to ensure uninterrupted progress of work.
- B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time not to delay work.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
- D. Do not store materials on structure in a manner that might cause distortion or damage to members of supporting structures. Repair or replace damaged materials or structures as directed.

**1.7 TESTING AND INSPECTION**

- A. Special Inspection as required by the NYC Building Code of all structural steelwork in the shop and field will be performed by an inspection agency retained by the Commissioner at no expense to the structural steel contractor. The inspection agency shall work under the direction of the architect. The structural steel contractor shall provide the inspection agency with the following:
  1. Schedule of all work in both shop and field with at least ten days' written notice before commencement of either activity.
  2. A complete set of approved shop and erection drawings.
  3. Cutting lists, order sheets, material bills, shipping bills and mill test reports.
  4. Information as to time and place of all rollings and shipment of material to shops.
  5. Representative sample pieces as requested by the testing agency.
  6. Full and ample means and assistance for testing all material.
  7. Proper facilities, including scaffolding, temporary work platforms, etc., for inspection of the work in the mills, shop and field.
- B. Each person installing connections shall be assigned an identifying symbol or mark and all shop and field connections shall be so identified so that the inspector can refer back to the person making the connection.
- C. The following minimum criteria shall be adhered to in testing of welds and bolts:
  1. All welds and bolts shall be examined by visual means.
  2. 25% of all welds, selected randomly, shall be measured.
  3. 25% of all bolts, selected randomly, shall be checked with calibrated torque wrench.
  4. In addition, all welds subject to tensile stress shall be examined by the Ultrasonic Method for 100% of their length.
  5. 10% of all manual fillet welds shall be tested by the magnetic particle method.
  6. 1'-0" at each end of automatic fillet welds shall be tested by the magnetic particle method.
  7. 100% of groove welds shall be tested by the ultrasonic method.
- D. Shop inspection will include examination of steel for straightness and alignment, fissures, mill scale, and other defects and deformities, as described in ASTM A6,



- examination of fabricated pieces for conforming with approved shop drawings, testing of bolts and welds, and inspection of shop painting. All shop welds shall be visually inspected and spot tested using Ultrasonic Method ASTM E114 and AWS, Section 6, Part C. The inspector shall identify all inspected welds.
- E. Field inspection will include examination of erected steel for welding, proper fitting and tensioning of bolts, alignment, trueness and plumbness, touching-up of shop coat, level of billets and base plates.
  - F. Inspection of welding will be such as to assure that the work is within the quality requirements specified below and elsewhere in this section of the specifications and will include:
    - 1. Ascertainment that the electrodes used for manual shielded metal-arc welding and the electrodes and flux used for submerged arc-welding conform to the requirements of this section of the specifications.
    - 2. Ascertainment that the approved welding procedures and sequence are followed without deviation, unless specific approval for change is obtained from the architect.
    - 3. The testing agency shall be prepared to utilize the following approved methods of testing:
      - a. Liquid penetrant inspection: ASTM E165.
      - b. Magnetic particle: ASTM E709.
      - c. Radiographic inspection: ASTM E94, E142, and E1032.
      - d. Ultrasonic inspection: ASTM E114 and AWS, Section 6, Part C.
  - G. When defects are revealed, additional inspection by whatever method is deemed necessary by the inspector shall be performed to the extent necessary to assure that the full amount of defect has been located. No further work shall be done on the assembly or sub-assembly in question until all the necessary corrections have been made. Defects shall be repaired, using the same welding procedure that was used initially in making the weld, unless otherwise approved by the architect. Inspection of the repaired weld shall be by the same method that was used to reveal the defect. A second repair of a defective area shall not be made without approval of the architect.
  - H. Apparatus and procedure for measuring torque and tension in high strength bolts and for calibrating wrenches shall be furnished and maintained by the structural steel contractor, and shall be approved by the inspection agency. Wrenches shall be calibrated each day of the beginning of the work, each time the bolt size or length of pressure hose is changed, and at such other times as the inspection agency may direct. Periodic checks of high strength steel bolt connections will be made in the field by the inspection agency. The structural steel contractor shall maintain at all times during erection a manual torque wrench, and shall provide a laborer and scaffolding as required for the testing of connections by the inspection agency, and shall at his own expense, furnish such facilities and provide such assistance as may be required for proper inspection.
  - I. A distinguishing mark will be placed on all work that has been inspected and approved. Material or work that is not acceptable will be designated by words such as "REJECT" or "REPAIR" marked directly on the material or work.
  - J. Inspection of Shop Painting
    - 1. Visually evaluate surface preparation by comparison with pictorial standards in accordance with SSPC-Vis 1.
    - 2. Measure dry film thickness of each coat with a magnetic film thickness gauge in accordance with SSPC-PA 2.
    - 3. Visually inspect dried film for runs, sags, dry spray, overspray and missed areas.

4. Repair defective or damaged areas in accordance with painting requirements specified. Architecturally exposed structural steel shall be free of runs and holidays. Make repairs to shop or field coat as directed.

#### **1.8 COORDINATION REQUIREMENTS**

- A. The structural steel contractor shall coordinate the structural steel work with the work of other Contracts. Verify all dimensions and details of this Contract and those of other Contracts that affect the work before proceeding. Any discrepancies shall be immediately reported to the architect.
- B. Be fully responsible for the accurate installation of the work. Any discrepancy that arises from the structural steel contractor's failure to execute the work in conformity to the drawings and specifications shall be properly remedied at the structural steel contractor's own expense and in a manner acceptable to the architect.
- C. Locate dimensionally on setting plans all anchor bolts, inserts, bearing and base plates, etc., and prepare and deliver all required templates and fully dimensioned setting plans in time for the proper execution of the work. Another contractor shall set anchor bolts. The structural steel contractor shall check all such settings for correctness after they have been cast in place, and before proceeding with erection work.
- D. Report to the architect and certify compliance with the above checking requirements in writing and indicate any inaccuracies found in the location of anchor bolts or inserts, and corrections, which must be made to their installation. Any inaccuracies not included in the report and found during or after steel erection shall be the responsibility of the structural steel contractor and the cost of corrective measures shall be borne by him.
- E. Use base lines, benchmarks, or other standards for survey work that have been provided or verified by others. If permanent building benchmarks have been established, these will be used for field checking.
- F. The structural steel contractor shall be fully responsible for all means, methods, techniques, sequences and procedures of construction. Coordinate with all other trades to insure that work of this section does not cause undue conflict. Ensure that location of erection devices such as cranes, derricks, booms or hoists, does not cause overstresses to steel frame, to work previously placed by other trades or to existing structures. When required, retain the services of a professional engineer to ascertain that erection devices do not create unsafe conditions or cause overstresses.

#### **1.9 SUBSTITUTION**

- A. The architect reserves the right to require substitute shapes of other sizes than those indicated on the drawings when it is apparent that the shapes specified cannot be furnished within the time required for the progress of construction. Make said substitutions without additional cost to the City of New York.

### **PART 2 - PRODUCTS**

#### **2.1 MATERIALS**

- A. Structural steel wide flange and structural tee rolled shapes: ASTM A992
- B. Channels, angles and plates: ASTM A36
- C. Pipe: ASTM A501 or ASTM A53, Grade B
- D. Hollow Structural Sections: ASTM A500, Grade B
- E. High Strength Bolts: ASTM A325, with hardened washers
- F. Unfinished Bolts: ASTM A307, with hexagonal heads and nuts

## HARPER STREET YARD

FMS ID# HWQF027C

- G. Anchor Rods : ASTM F1554, Grade 36
- H. Filler metal for welding electrodes: ASTM A233 Class E70 Series
- I. Structural steel primer paint: rust inhibitive primer conforming to TT-P-86, Type I; or Tnemec Exterior 10-99 or 88HS-555
- J. Structural steel field paint for exposed members: Tnemec 530 Omnithane

## PART 3 - EXECUTION

### 3.1 FABRICATION

- A. All shop connections shall be welded or high strength bolted unless specifically shown otherwise. Fabricate work in shop in as large assemblies as practicable.
- B. Camber: All beams, girders and other members shall be fabricated with natural camber up.
- C. Mill column ends and bearing stiffeners to give full bearing over the cross section. Plane contact surfaces of bearing plates when required by the AISC Specifications. It is not necessary to plane bottom surfaces of plates on grout beds.
- D. Drill or punch holes at right angles to the surface of the metal, not more than 1/16" larger than the connector diameter. Do not make or enlarge holes by burning. Drill material having a thickness in excess of the connector diameter and material thicker than 7/8". Holes shall be clean-cut without torn or ragged edges. Remove outside burrs resulting from drilling operations.
- E. Provide holes in members to permit connection of the work of other trades. Use suitable templates for proper location of these holes. Steel requiring adjustment or accurate alignment shall be provided with slotted holes or full bearing shims as shown.
- F. Provide holes, slots and openings required by other trades together with necessary reinforcing required. Use suitable templates for proper location of these openings. All such openings shall be shown on the shop drawings. No change in size or location will be permitted without prior approval.
- G. Manual flame cutting shall be done only with a mechanically guided torch. An unguided torch may be used provided the cut is within 1/8" of the required line.

### 3.2 CONNECTIONS

- A. Provide connections as shown on the drawing exactly as detailed. Where connections are not detailed, the minimum connections shall comply with appropriate tables headed, "Framed Beam Connections" shown in the AISC "Manual of Steel Construction" unless otherwise noted on the drawings. Use high strength bolts or welds unless otherwise shown.
- B. Proportion and detail all connections on shop drawings to resist forces shown on design drawings. If no reactions are indicated on design drawings, design connections for non-composite beams to resist the end reaction shown in the AISC tables for Uniform Load Constants for Beams. Connections for composite beams shall be proportioned to resist 150% of the above-mentioned tabulated load.
- C. Bolting
  - 1. Bolts shall be of a length that will extend not less than 1/4" beyond the nuts. Enter bolts into holes without damaging the thread.
  - 2. Use high-strength bolts in friction as shown. Make high-strength bolted joints without the use of erection bolts. Bolt heads and nuts shall rest squarely against the metal. Where structural members have sloping surface, bolted connections shall be provided with beveled washers to afford square seating or framing for bolt heads or nuts. Bring members tightly together with sufficient high-strength "fitting-up" bolts that shall be retightened as all the bolts are finally tightened.

Manual torque wrenches will not be accepted for final tightening. Protect bolt heads from damage during placing. Final tightening of high-strength bolts shall be by properly calibrated power torque wrenches. Bolts that have been completely tightened shall be marked for identification.

**D. Welding**

1. Do not begin structural welding until joint elements are inspected for surface preparation, fit-up, and cleanliness of surface to be welded and are then bolted or tacked in intimate contact and adjusted to dimensions shown on drawings, or both, with allowance for any weld shrinkage that is expected. No members are to be spliced without prior approval by the architect.
2. Pre-heat and interpass temperature shall be in accordance with Table 3.2 (including footnotes) of the AWS D1.1 Structural Welding Code, Latest Edition. The temperature shall be measured from the side opposite to that which the pre-heat is applied, where possible.
3. All groove welds shall be continuous and full penetration welds unless otherwise shown on the design drawings. Welds made without the aid of a back-up bar shall have their roots chipped, ground or roughened out to sound metal from the second side, before welding is done from the second side.
4. All welds shall be sound throughout. There shall be no crack in any weld or weld pass. Weld may be considered sound if it contains only slight porosity or fusion defects that are well dispersed.
5. The heat, input, length of weld and sequence of weld shall be controlled to prevent distortions. The surfaces to be welded and the filler metals to be used shall be subject to inspection before any welding is performed.

**3.3 SHOP PAINTING AND CLEANING**

- A. Remove all rust, scale, grease and other detrimental foreign matter in accordance with the SSPC Painting Manual - Specification SP-3, Power Tool Cleaning.
- B. Immediately after surface preparation, apply structural steel primer paint where specified, in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 2.0 mils. Use painting methods that result in full coverage of joints, corners, edges and exposed surfaces. Use type of primer paint as specified in the "Materials" Section of this Specification. Apply two coats to surfaces that will be inaccessible after erection.
- C. Paint all structural steel in accordance with the foregoing specification, except as follows:
  1. Steel that is to receive spray-on fireproofing.
  2. Within 2" of field welds or welds made after paint is applied.
  3. Within 3" of high strength friction bolts.
  4. Machined surfaces and threaded parts required for adjustment of the structure. Protect these with suitable rust inhibiting coating that may be removed after final installation of the work so that proper finished coatings may be applied.
- D. Field Painting
  1. After erection, all damaged areas in shop coat, exposed surfaces of bolt heads, nuts and washers, and all field welds and unpainted areas adjacent to field welds and high strength bolts shall be painted with a "touch-up" application of the same paint used in the shop coat and then painted with the same paint used for shop coat tinted another color. Retouch in field, any scraped, abraded, and unpainted surfaces. Painting shall be as specified for shop coats.
  2. Structural steel that is to support mechanical equipment and will be left exposed to the weather in the finished project shall be field painted with one coat of Tnemec

530 Omnithane at 2.0 - 4.0 mils DFT. Apply finish coat of Tnemec N69F Hi Build Epoxoline II at 3.0 - 5.0 DFT. These applications shall be the responsibility of the structural steel contractor.

### 3.4 ERECTION

- A. Verify field measurements prior to start of erection. Check the alignment and elevation of all column supports and location of all anchor bolts with transit and level instruments before starting erection. Notify architect of any errors. Obtain architect's approval of methods proposed for correcting errors prior to proceeding with corrections and erection.
- B. Column billets and bearing plates shall be supported and aligned on steel wedges, shims, or leveling nuts. After the supported members have been plumbed and properly positioned by instrument and anchor nuts tightened, the entire bearing area under the plate shall be filled with grout specified in another Section. Wedges and shims shall be set back a minimum of 3/4" from the edges of plates and shall be left in place. Leveling plates are not permitted.
- C. Plumbing, Leveling and Bracing
  - 1. Structural steel shall be erected true and level, and temporary bracing shall be introduced wherever necessary to provide for all loads to which the structure may be subjected, including equipment and the operation thereof. Such bracing shall be left in place as long as may be required for safety. No welding shall be done or bolts drawn up tight until structural steel has been properly aligned. Obtain approval for guy locations to assure lack of interference with operations of other trades.
- D. Drifting
  - 1. Light drifting necessary to draw holes together will be permitted, but drifting of unfair holes will not be permitted. Twist drills shall be used to enlarge holes as necessary to the next larger size; use next larger size bolts as required. Reaming that weakens the members, or makes it impossible to fill the holes properly or to adjust accurately after reaming, will not be allowed.

END OF SECTION

**NO TEXT ON THIS PAGE**

**SECTION 053100**

**STEEL DECKING**

**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 WORK INCLUDED**

- A. Work of this section includes all labor, materials, equipment and services necessary to complete the metal deck work as shown on the drawings as specified herein, including, but not limited to the following:
  - 1. Floor deck
  - 2. Roof deck
  - 3. All necessary deck supports and reinforcing other than principal framing members including diagonals at columns, angles, plates, and etc.
  - 4. Flashing, cell closures, closure plates and sheet metal work required to contain concrete.
  - 5. Ceiling hanger tabs at new decking composite with concrete where new suspended ceilings are required.

**1.3 RELATED WORK SPECIFIED ELSEWHERE**

- A. Concrete and reinforcement over decking
- B. Structural Steel
- C. Load Bearing Masonry
- D. Composite open web joists
- E. Shoring of metal deck where unsupported span exceeds the allowable
- F. Ceiling systems
- G. Mechanical and electrical where supported from deck
- H. Fireproofing systems
- I. Sheet metal work

**1.4 QUALITY ASSURANCE**

- A. Except as modified by governing codes and by this specification, comply with the applicable provisions and recommendations of the following codes and standards:
  - 1. American Iron and Steel Institute (AISI) "Specification for the Design of Cold-Formed Steel Structural Members".
  - 2. American Welding Society (AWS), D1.1 "Structural Welding Code" and D1.3 "Structural Welding Code-Sheet Steel".
  - 3. Steel Deck Institute (SDI) "Design Manual for Composite Decks, Form Decks, and Roof Decks".
- B. The work under this section shall be performed by a fabricator and erector submitting conclusive evidence of having satisfactorily completed work of similar scope and of having the necessary skill, equipment, facilities and capacities to fabricate and perform the erection in accordance with the construction schedules and in full compliance with all requirements of the Contract Documents.

**1.5 DESIGN REQUIREMENTS**

## **HARPER STREET YARD**

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- A. Metal deck unit sizes and gages are indicated on the drawings. Gages indicated on the drawings are a minimum. Thickness of deck may be required to be increased by deck manufacturer for loadings indicated on drawings.
- B. Unit shall span over three or more supports except where steel layout does not permit.
- C. Maximum allowable deflection under live load plus super imposed dead load shall not exceed  $(1/360)$  of the span or  $(1/4)$  inch whichever is less.
- D. Deck shall be sized as unshored. Shoring of deck is not permitted unless specifically shown in areas on the drawings.
- E. Use of piercing, non-piercing, and integral hanger tabs is not permitted at roof deck.
- F. Units included in a fire rated assembly must be classified in appropriate UL design and MEA approvals.

### **1.6 SUBMITTALS**

- A. Samples of each type of decking material. Product data, including manufacturers specifications, load tables, section properties and installation instructions for each type of decking and accessories.
- B. Shop drawings for all installations showing gauges, type of deck, any shoring required, where located, welding details necessary for fabrication to fit in place, and all accessories. Do not use reproductions of the Design Drawings.
- C. Ceiling tab, fillers, closures and the like.
- D. Certification of specification compliance.

### **1.7 DELIVERY, STORAGE AND HANDLING**

- A. Deliver material to site at such intervals to ensure uninterrupted progress of work.
- B. Store materials to permit easy access for inspection and identification. Keep deck off ground, using pallets, platforms or other supports. Protect deck and packaged materials from corrosion and deterioration.
- C. Do not store materials on structure in a manner that might cause distortion or damage to members of supporting structures. Repair or replace damaged materials or structures as directed.

### **1.8 COORDINATION REQUIREMENTS**

- A. Examine all work prepared by others to receive work of this section and report any defects affecting installation to the contractor for correction. Commencement of work will be construed as complete acceptance of preparatory work by others.
- B. If the supporting beams are not properly aligned or sufficiently level to permit proper bearing of the steel decking units, the steel decking contractor shall bring the matter to the attention of the contractor for corrective action. The steel decking units are not to be placed until the necessary correlations are made.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Galvanized Composite Steel Decking: Conforming to ASTM A611 or A653 with minimum yield strength of 33,000 psi. Coating conforming to ASTM A653 G90. Deck shall have deformations specifically designed to produce composite action between the deck and the concrete slab by mechanical bond. The Contract Documents indicate required section profile and minimum gauge. Contractor shall provide heavier gauge if the minimum gauge indicated is not sufficient to support construction loads as unshored forms and/or total load as indicated on the drawings based on the composite section.



- B. Galvanized Non-Composite Steel Decking: Galvanized Steel Decking: Conforming to ASTM A611 or A653 G90 with minimum yield strength of 33,000 psi. The Contract Documents indicate required section profile and minimum gauge. Contractor shall provide heavier gauge if minimum gauge indicated is not adequate to support total loads as shown on the drawings.
- C. Anchor clips, vent clips, welding washers, flashing, saddle plates, sump pans, other accessories shall be those types, sizes, and configurations recommended by the decking manufacturer, and shall be of the same material and finish as the deck units.
- D. Cell closure flexible strips, and fillers shall be of material in compliance with applicable building code governing class of construction.
- E. Provide metal closure strips at edges of all slabs and openings, which serve as pour stops for concrete. Gauge shall be sufficient to span or cantilever from steel beams.
- F. Roof sump pans: Fabricate from a single piece of galvanized sheet steel of the same quality as the deck units; not less than nominal 0.0747" (14 gauge) thick before galvanizing; with bottoms level after erection and sloping sides to direct water flow to the drain, unless otherwise shown. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than 3" wide. Recess pans not less than 1-1/2" below the roof deck surface, unless otherwise shown or required by deck configuration. Weld to deck at maximum 12" o.c.

## 2.2 MANUFACTURE

- A. Supply manufactured deck units in accordance with the applicable requirements of the Steel Deck Institute's "Design Manual for Floor Decks and Roof Decks".
- B. Deck shall be manufactured by one of the following:
  - 1. CSi Metal Dek Group
  - 2. Wheeling Corrugating Co.
  - 3. Vulcraft

## 2.3 FABRICATION

- A. Fabricate deck units in accordance with the AISI's "Specification for the Design of Cold-Formed Steel Structural Members" and accepted shop drawings. Fabricate deck units to the sizes and configurations indicated and cut to lengths which will span not fewer than three supporting members; use only full length units at overhang where indicated in a manner that laps fit tightly. Locate openings for penetrations where indicated and provide support framing and edge reinforcement for all openings.

## PART 3 - EXECUTION

### 3.1 INSPECTION

- A. Inspection of the metal deck will be performed by an inspection agency retained by the Commissioner at no expense to the contractor. The inspection agency shall work under the direction of the architect. Contractor shall provide the inspection agency with the following:
  - 1. Schedule of all work in both shop and field with at least ten days written notice before commencement of either activity.
  - 2. A complete set of approved shop and erection drawings.

### 3.2 ERECTION

- A. The erection of the steel decking shall be performed according to the manufacturer's standards. Erection shall closely follow the erection of structural steel.

## HARPER STREET YARD

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- B. The steel decking units shall be placed on the supporting steel framework and adjusted to final position before being permanently fastened. Each unit shall be brought to proper bearing on the supporting beams.
- C. Decking units shall be fastened to the steel framework at ends of units and at all intermediate supports by  $\frac{3}{4}$ " diameter puddle welds spaced not more than 12" o.c. across width of unit. Deck shall, where possible, span 3 or more supports.
- D. The side laps of adjacent units shall be fastened by approved method (to be shown on shop drawings) between supports at intervals of 3 feet between supporting beams. End laps of sheets shall be a minimum of 2" inches.
- E. All welding shall be performed by competent experienced welding mechanics. All welds, shall be given a protective coat of paint as specified in painting article of section 05100.
- F. All abraded or damaged protective surfaces of steel decking work shall be touched up with a protective coat of paint by this contractor as erected.
- G. At composite deck with concrete, metal hanger tabs shall be installed at all panel sidelaps 24 inches o.c., longitudinally 24 inches o.c. to create a grid nominally 24 inches by 24 inches. Tabs shall be 18 gauge minimum, capable of supporting the specified ceiling, tabs shall be a minimum of 18 gauge capable of supporting ceiling and all other suspended loads or 200 pounds, whichever is greater.
- H. All unframed deck openings in composite deck with concrete larger than 6" shall be reinforced as follows:
  - 1. Holes 6" - 12"/perpendicular to deck span, 16 gauge flat sheet extending 6" beyond hole on all sides.
  - 2. Holes 12" - 24"/perpendicular to span, 12" max/parallel to span: C4 x 5.4 channels on flat, each side, perpendicular to deck span, extending a minimum of 3 ribs beyond opening.
  - 3. Openings larger than these dimensions require supplemental floor framing.
  - 4. All reinforcement shall be welded to the topside of deck.
- I. All unframed openings in roof deck shall be reinforced as follows:
  - 1. Holes less than 8": 18 gauge flat sheet extending 8" min. beyond hole in all directions.
  - 2. Holes 8" - 13": 16 gauge flat sheet extending 8" min. beyond hole in all directions.
  - 3. Holes greater than 13" require supplemental floor framing. Notify engineer.
  - 4. All reinforcing shall be welded to the topside of deck. Reinforcing plate shall extend at least 3" beyond next full metal deck rib.

### 3.3 CLEANING UP

- A. Remove all equipment, unused materials and debris from the site immediately upon the completion of this work.

END OF SECTION

**SECTION 054000**

**COLD FORMED METAL FRAMING**

**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 cold formed metal framing as indicated on the drawings and/or specified herein, including, but not limited to, the following:
  - 1. "C" shaped steel studs for exterior non-load bearing wall frame construction.
  - 2. "C" shaped steel joists.
  - 3. Anchors and accessories.
  - 4. Gypsum sheathing.
  - 5. Cement board back-up sheathing at tile.
  - 6. Field inspection.

**1.3 RELATED SECTIONS**

- A. Structural steel - Section 051200.
- B. Building insulation - Section 072100.
- C. Metal panels - Section 074213.
- D. Interior steel stud construction - Section 092900.
- E. Tile - Section 093000.

**1.4 QUALITY ASSURANCE**

- A. Component Design: Compute structural properties of studs in accordance with AISI "North American Specification for the Design of Cold Formed Steel Structural Members."

- B. Fire-Rated Assemblies: Where framing units are indicated to be components of fire-resistance rated assemblies, provide cold formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspection agency acceptable to authorities having jurisdiction. Products used in the assembly shall carry a classification label from an approved testing and inspection agency.
- C. Qualifications
  - 1. Manufacturer's Qualifications: Minimum three years' experience in producing products of the type specified.
  - 2. Installer's Qualifications: Minimum three years' experience in installation of the type of product specified.
  - 3. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M "Structural Welding Code - Steel" and AWS DL3 "Structural Welding Code – Sheet Steel."
- D. Pre-Installation Meeting
  - 1. Convene meeting at project site within one week of scheduled start of installation with representatives of the following in attendance: City of New York, Commissioner, General Contractor, and metal framing subcontractor.
  - 2. Review substrate conditions, requirements of related work, installation instructions, storage and handling procedures, and protection measures.
  - 3. Keep minutes of meeting, including responsibilities of various parties and deviations from specifications and installation instructions. Distribute minutes to attendees within 72 hours.
- E. Comply with the following standards:
  - 1. American Iron and Steel Institute (AISI):
    - a. "North American Specification for the Design of Cold-Formed Steel Structural Members", latest edition.
    - b. "Standard for Cold-Formed Steel Framing General Provisions".
  - 2. American Welding Society (AWS):
    - a. Structural Welding Code (D1.1).
    - b. Specifications for Welding Sheet Steel in Structures (E1.3).
  - 3. ASTM:
    - a. A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

- b. A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- c. A924 - Standard Requirements for Sheet Steel, Metallic-Coated by the Hot-Dipped Process.
- d. A1003 - Standard Specification for Steel Sheet, Carbon, Metallic- and Non-Metallic-Coated for Cold-Formed Framing Members.
- e. C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
- f. C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
- g. ASTM C 1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.

**1.5 SUBMITTALS**

- A. Product Data: For information only, submit copies of manufacturer's product information and installation instructions for each item of cold formed framing and accessories.
- B. Shop Drawings
  - 1. Submit shop drawings for special components and installations not fully dimensioned or detailed in manufacturer's product data. Include placing drawings for framing members showing size and gauge designations, number, type, location and spacing. Indicate supplemental bracing, splices, accessories and details as may be required for proper installation.
  - 2. If the Contractor elects to prefabricate framing members into panels for erection, he shall submit shop drawings of such panels at suitable scale showing all dimensions, components, and methods of fastening and support.
- C. For Fasteners, submit product data sheet and samples.
- D. Engineering Data
  - 1. Submit Engineering Data drawings to the Commissioner for review. The Contractor is responsible for the structural design and supports for the cold formed metal frame, and must show his proposed system and how the Performance Criteria noted below is accommodated 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. 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. Quality Assurance Submittals: Submit the following:**

1. Qualifications: Proof of manufacturer, installer, and welder qualifications.
2. Structural design calculations.
3. Certificates
  - a. Submit mill certificates signed by framing member/accessory manufacturer certifying compliance with material requirements.
  - b. Welder certificates.
4. Manufacturer's installation instructions for framing members and framing accessories.

**1.6 PERFORMANCE CRITERIA**

- A. Cold formed metal framing system shall be designed, fabricated, and installed to withstand a 30 psf suction and pressure load (or greater if required by Code) with a maximum deflection of  $L/720$  with tile and  $L/360$  for metal panels.
- B. Design system to accommodate vertical deflection of structural building frame, live loading, seasonal and day/night temperature ranges and construction tolerances.
- C. In New York City, comply with Local Law 17-95 for seismic connections and loads.
- D. Comply with prevailing Code requirements for seismic connections and loads.

**1.7 PRODUCT DELIVERY AND STORAGE**

- A. Protect metal framing units from rusting and damage. Deliver to one project site in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade. Store off the ground in a dry ventilated space or protect with suitable waterproof coverings. Conform to storage and handling requirements of AISI "Code of standard Practice."

**PART 2 PRODUCTS**

**2.1 MANUFACTURER**

- A. Provide cold-formed steel framing manufactured by Marino/Ware, Dale/Incor, Superior Steel Studs, Dietrich Metal Framing, Super Stud Building Products or approved equal.

**2.2 METAL FRAMING: GENERAL**

- A. System Components: With each type of metal framing required, provide manufacturer's standard steel runners, (tracks), blocking, lintels, clip angles, shoes, reinforcements, fasteners and accessories, as recommended by manufacturer for the applications indicated, as needed to provide a complete metal framing system.

**2.3 MATERIALS**

- A. Steel Sheet for Studs and Tracks: ASTM A 1003 Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
  - 1. Grade: As required by structural performance.
  - 2. Coating: G90 galvanized coating.
- B. Steel Sheet for Clips: ASTM A 653, structural steel, zinc coated, of grade and coating as follows:
  - 1. Grade: As required by structural performance.
  - 2. Coating G90 galvanized coating.

**2.4 FRAMING MEMBERS**

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated punched, with stiffened flanges; thickness and grade as required by structural performance.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths compatible with studs un-punched, with un-stiffened flanges; thickness and grade as required by structural performance.

**2.5 FRAMING ACCESSORIES**

- A. Stamp manufacturer's name on each accessory item.
- B. Provide screws with accessories designated for screw attachment.
- C. Connector Devices
  - 1. Vertical Deflection Clips: VertiClip, including step bushings, as manufactured by The Steel Network Inc. (919) 845-1025 or approved equal. Rigid attachments to structure and screw attachment to stud web using step-bushings to permit frictionless vertical movement. 68 mils minimum thickness, size as required by structural design calculations.
  - 2. Rigid Clip Angles: StiffClip as manufactured by The Steel Network Inc., or approved equal, size as required by structural design calculations. Rigid attachment to structure and stud web.

**D. Bridging**

1. Cold Rolled Channel: 1-1/2 by 1/2 inch by 56 mil thick.
  - a. Bridging Clip: BridgeClip as manufactured by The Steel Network Inc. or approved equal. Provide attachment through stud punch-out clamping onto stud web and wrapping around bridging channel. Provide holes for screw attachment to stud web and channel.
2. Flat Strap: Width and thickness as required by structural design calculations. Rigid attachment to stud flange.
3. Solid Bridging: Channel shaped bridging with lipped flanges and integral formed clips. Screw attachment to stud. 33 mils minimum thickness, size as required by structural design calculations.
4. Bridging and accessories shall be hot dip zinc coated per ASTM A 153.

**2.6 FASTENERS**

- A. Screws: Corrosion resistant coated, self-drilling, pan or hex washer head. Provide screw type and size as required by structural design calculations.
- B. Anchor Bolts and Studs: ASTM A 307, Grade A, carbon steel, with hex-head carbon steel nuts and flat steel washers. Hot-dip zinc coated in accordance with ASTM A 153. Provide bolt or stud type and size as required by structural design calculations.
- C. 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 per ASTM E 488 conducted by a qualified independent testing agency.
- D. 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 per ASTM E 1190 conducted by a qualified independent testing agency.

**2.7 GALVANIZING TOUCH-UP**

- A. For touching up damaged galvanized surfaces after erection, provide "Silver Galv" made by Z.R.C. Worldwide or approved equal. Apply to a dry film thickness of 1.5 to 3.0 mils.

**2.8 GYPSUM SHEATHING AND RELATED ACCESSORIES**

- A. Gypsum Sheathing: 5/8" thick "Dens-Glass Fireguard," Type X, made by Georgia Pacific, "Securock Glass-Mat Sheathing" made by U.S. Gypsum Co., "Gold Bond EXP Extended Exposure Sheathing" made by National Gypsum Co., or approved equal, meeting ASTM C1177, Type X.



- B. Fasteners: 1-1/4" Type S-12 screws "Climaseal" finish.
- C. Joint Treatment: Provide a one-part high performance sealant conforming to ASTM C 920, Type S, Grade NS, Class 25. Apply enough of the same material to each fastener to cover completely when trowel flat.

## **2.9 CEMENT BOARD AND ACCESSORIES**

- A. Cement Board: "Durock Exterior Cement Board," 5/8" thick, made by U.S. Gypsum Co., or approved equal.
- B. Fasteners: 1-1/4" Type S-12 Wafer Head, "Climaseal" finish.
- C. Joint Reinforcing: 2" wide Durock Exterior Tape, open weave with pressure sensitive adhesive on one side.
- D. Sealant: Same as noted above.

## **2.10 FABRICATION**

- A. Framing components may be prefabricated into panels prior to erection. Fabricate panels plumb, square, true to line and braced against racking with joints welded. Perform lifting of prefabricated panels in a manner to prevent damage or distortion in any members in the assembly.
- B. Fastenings: Attach similar components by welding. Attach dissimilar components by welding, bolting or screw fasteners, as standard with manufacturer.
- C. Wire tying of framing components is not permitted.

# **PART 3 EXECUTION**

## **3.1 INSPECTION**

- A. Examine the areas and conditions where cold formed metal framing 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. Methods of construction shall be piece by piece.
- B. Connections shall be accomplished with self-drilling screws or welding so that the connection meets or exceeds the design loads required at that connection.
- C. Studs shall be installed seated squarely (within 1/16") against the web portion of the top and bottom tracks. Tracks shall rest on a continuous, uniform bearing surface.

- D. Cutting of steel framing members may be accomplished with a saw or shear. Torch cutting of loaded members is not permitted. Cutting of loaded members is not permitted unless under supervision of the Commissioner.
- E. Temporary bracing shall be provided and left in place until work is permanently stabilized.
- F. Bridging shall be of size and type shown on the approved shop drawings and as called for in the engineering calculations.
- G. Install headers in all openings that are larger than the stud spacing in that wall. Form headers as shown on the drawings.
- H. Insulation meeting the requirements of Section 072100 shall be placed in all jamb and header type conditions that will be inaccessible after their installation into the wall.
- I. Provide jack studs to support each end of headers. These studs shall be securely connected to the header and must seat squarely in the lower track of the wall, and be properly attached to it.
- J. If by design, a header is low in the wall, the less than full-height studs (cripples) that occur over the header shall be designed to carry all imposed loads.
- K. Wall track shall not be used support any load unless specifically designed for that purpose.
- L. All axially loaded members shall be aligned vertically, to allow for full transfer of the loads down to the foundation. Vertical alignment shall be maintained at floor/wall intersections or alternate provisions for load transfer may be made.
- M. Holes that are field cut into steel framing members shall be within the limitation of the product and its design. Provide reinforcement where holes are cut through load bearing members in accordance with manufacturer's recommendations and as approved by the Commissioner.
- N. Touch up all steel bared by welding using touch up coating specified herein.
- O. Studs shall be spaced to suit the design requirements and limitations of collateral facing materials.
- P. Care should be taken to allow for additional studs at intersections, corners, doors, windows, control joints, etc., and as called for in the shop drawings or design calculations.

## **HARPER STREET YARD**

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- Q. Install supplementary framing, blocking, and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight or loading resulting from item supported.
- R. Provide for structure movement, expansion shall be allowed where indicated and necessary by design or code requirements.
- S. Frame both sides of expansion and control joints with separate studs; do not bridge the joint with components of stud system.
- T. Install horizontal bridging in stud system, spaced (vertical distance) at not more than 48 inches on center. Fasten at each intersection.
- U. Splicing of axially loaded members or floor joists shall not be permitted.
- V. Wire tying of members is not permitted.

### **3.3 INSTALLATION OF GYPSUM SHEATHING**

- A. Fasten sheathing to exterior of each stud with specified fasteners spaced 3/8" from ends and edges and approx. 8" o.c. at each stud. Install fasteners in accordance with manufacturer's recommendations using 2500-RPM maximum screw gun. Sheathing board shall be installed horizontally. Apply sealant between joints and trowel flush; and apply sealant around sheathing perimeter and at interface with other materials. Cover fastener heads with sealant and trowel flush.
- B. Refer to Section 072700 for vapor permeable air barrier description.

### **3.4 INSTALLATION OF CEMENT BOARD**

- A. Apply cement board panels horizontally with ends over supports. Fit ends and edges closely, but not forced together. Apply sealant around sheathing perimeter and at interface with other materials. Stagger end joints in successive courses.
- B. Fasten cement board panels to framing with specified fasteners. Install fasteners in accordance with manufacturer's recommendations using 2500-RPM maximum screw gun. Drive fasteners in field of panels first, working towards ends and edges. Hold panel in firm contact with framing while driving fasteners. Space fasteners max. 8" o.c. along each stud with perimeter fasteners at least 3/8" from ends and edges. Drive screws so heads are flush with surface of panels, to provide firm panel contact with framing. Apply Durock Exterior Tape centered over all joints and corners.

C. Refer to Section 072700 for vapor permeable air barrier description.

END OF SECTION

**SECTION 055000**

**MISCELLANEOUS METALS**

**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. Open riser steel stairs, including galvanized steel stair treads, stringers and rails.
  - 3. Galvanized steel angle posts supporting removable ornamental grilles and sliding gate.
  - 4. Aluminum removable ornamental grilles and sliding gate.
  - 5. Stainless steel island curb.
  - 6. Stainless steel railings.
  - 7. Light steel framing and supports, not included as part of work of other trades.
  - 8. Miscellaneous steel trim, corner guards, angle guards and channels.
  - 9. 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.
  - 10. Prime painting, touch-up painting, galvanizing and separation of dissimilar metals for work of this Section.
  - 11. 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. Painting - Section 099000.

**1.4 QUALITY ASSURANCE**

- A. 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.
- B. 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.
- C. 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. AWS D1-1 "Structural Welding Code," American Welding Society.
  - 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.
- D. 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.
- E. Engage the services of a galvanizer who has demonstrated a minimum of three 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 Commissioner has the right to inspect and approve or reject the galvanizer/galvanizing facility.
- F. The galvanizer/galvanizing facility must have an ongoing Quality Control/Quality Assurance program which has been in effect for a minimum of three years and shall provide the Commissioner with process and final inspection documentation. The galvanizer/galvanizing facility must have an on-premise testing facility capable of measuring the chemical and metallurgical composition of the galvanizing bath and pickling tanks.
- G. 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."

**1.5 PERFORMANCE STANDARDS**

- A. Stairs and railings shall be constructed to conform to the following performance standards:
  - 1. Stairs and platforms shall support a live load of one hundred (100) psf and a concentrated live load of three hundred (300) lbs. and shall have a live load deflection limited to 1/360 of the span. Loads shall not apply simultaneously.
  - 2. For projects in New York City, railings shall be designed to resist loads as specified in Article 3, Section 27-558 of the New York City Building Code.

**1.6 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.
- B. Shop Drawings: Shop drawings for the fabrication and erection of all assemblies of miscellaneous iron work which are not completely shown by manufacturer's data sheets. 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.
- C. Engineering Data
  - 1. Before any stairs and railings are fabricated, submit engineering data drawings to the Commissioner 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. 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.
- D. 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.

- E. 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.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

#### **A. Metals**

1. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
2. Steel Plates, Shapes and Bars: ASTM A 36.
3. Steel Bar Grating: ASTM A 1011/A or ASTM A 36.
4. Steel Tubing: Cold formed, ASTM A 500; or hot rolled, ASTM A 501.
5. Structural Steel Sheet: Hot rolled, ASTM A 570; or cold rolled, ASTM A 611, Class 1; of grade required for design loading.
6. Galvanized Structural Steel Sheet: ASTM A 924, of grade required for design loading. Coating designation G90.
7. 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.
8. Gray Iron Castings: ASTM A 48, Class 30, unless another class is indicated or required by structural loads.
9. Malleable Iron Castings: ASTM A 47, grade as selected by fabricator.
10. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
11. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.
12. Aluminum: Comply with the following standards for the forms and types of aluminum for the required items of work.
  - a. Alloy and Temper: Provide alloy and temper as indicated or as otherwise recommended by the aluminum producer or finisher.



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- b. Aluminum Extrusions, Bars and Shapes: Alloy and temper recommended by aluminum producer or finisher for type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 221 for 6063-T6.
  - c. Extruded Pipe and Tube: ASTM B 429, alloy 6063-T6.
  - d. Aluminum Plate and Sheet: Alloy and temper recommended by aluminum producer or finisher for type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 209, alloy 6061-T6.
  - e. Bars, Rods and Wire: ASTM B 211.
  - f. Drawn Seamless Tube: ASTM B 483, alloy 6063-T832.
  - g. Castings: ASTM B 26; alloy A356-T6.
  - h. Forgings: ASTM B 247, alloy 6061-T6.
- B. Stainless Steel (Brushed No. 4 finish)
- 1. Comply with the following standards for the forms and types of stainless steel for the required items of work.
    - a. Pipe: ASTM A 312, Grade TP 316
    - b. Sheet, Strip, Flat Bar and Plate: ASTM A 666, Type 316.
    - c. Tubing: ASTM A 554, Grade MT 316.
- C. Grout: Non-shrink, non-metallic grout, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- D. 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.
- E. Fasteners
- 1. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.
  - 2. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.
  - 3. Anchor Bolts: ASTM F 1554, Grade 36.
  - 4. Lag Bolts: ASME B18.2.1.
  - 5. Machine Screws: ASME B18.6.3.
  - 6. Plain Washers: Round, carbon steel, ASME B18.22.1.
  - 7. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.
  - 8. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.

- 9. Lock Washers: Helical spring type carbon steel, ASME B18.21.1.
- F. Shop Paint: Shop prime all non-galvanized miscellaneous metal items using Series 88 Azerox Primer made by Tnemec, ICI Devco "Rust Guard" quick dry alkyd shop coat No. 41403, Interlac 393" by International Protection Coatings or approved equal.
  - 1. If steel is to receive high performance coating as noted in Section 099000, shop prime using primer noted in Section 099000.
- G. Bituminous Paint: Cold applied asphalt emulsion complying with ASTM D 1187.
- H. 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 approved equal. Apply to a dry film thickness of 1.5 to 3.0 mils.

## 2.2 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.
- 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 Section 099000 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.

## 2.3 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 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 conform to the following:
  - 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 384: Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies.
  - 5. ASTM A 385: Practice for Providing High Quality Zinc Coatings.
  - 6. ASTM A 924: Galvanized Coating on Steel Sheets.
  - 7. 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 Commissioner.

## **2.4 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.

## **2.5 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 Commissioner.

1. Welding
  - a. Shall be in accordance with AWS D1.1 Structural Welding Code 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 so as 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.

## **2.6 MISCELLANEOUS METAL 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 Sections.
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. Open Riser Service Stairs**

1. General: Construct stairs to conform to sizes and arrangements shown; joint pieces together by welding. Provide complete stair assemblies, including metal framing, hangers, railings, newels, balusters, struts, clips, brackets, bearing plates and other components necessary for the support of stairs and platforms and as required to anchor and contain the stairs on the supporting structure.
2. Stair Framing: Fabricate stringers of structural steel channels, or plates, or a combination thereof. Provide closures for exposed ends of stringers. Construct platforms of structural steel channel headers and miscellaneous framing members as shown. Bolt or weld headers to strings and newels and framing members to strings and headers; fabricate and join so that bolts, if used, do not appear on finish surfaces.
3. Attach treads to stringers by means of brackets made of steel and angles or bars. Weld brackets to strings and attach metal treads to brackets by welding, riveting or bolting.

**C. 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.

- D. 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.

**2.7 HANDRAILS AND RAILINGS**

- A. Welded Connections:** Fabricate handrails and railings for connecting members by welding. Cope components at perpendicular and skew connections to provide close fit, or use fittings designed for this purpose. Weld connections 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 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.
  5. Form changes in direction of railing members by radius bends.
  6. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain profile of member throughout entire bend without buckling, twisting, or otherwise deforming exposed surfaces of handrail and railing components.
  7. Provide wall returns at ends of wall-mounted handrails, close ends of returns.

8. Close exposed ends of handrail and railing members with prefabricated end fittings.
9. Brackets, Flanges, Fittings, and Anchors: Provide brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing members to other work, unless otherwise indicated.
  - a. Furnish inserts and other anchorage devices for connecting handrails and railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.
  - b. For railing posts set in concrete, provide preset sleeves of steel, not less than 6 inches long and inside dimensions not less than 1/2 inch greater than outside dimensions of post, with steel plate forming bottom closure.

## **2.8 ORNAMENTAL GRILLES**

- A. Fabricate removable bar grille panels and sliding gate to designs indicated from aluminum bars and shapes of sizes and profiles indicated. Form bars by bending, forging, coping, mitering, and welding. Finish: Power coated, color as selected by Commissioner.
- B. Form simple and compound curves by bending members in jigs to produce uniform curvature of radii indicated for each configuration required; maintain profile of member throughout entire bend without buckling, twisting, or otherwise deforming exposed surfaces of components.
- C. Welding: Interconnect grille members with full-length, full-penetration welds, unless otherwise indicated. Use welding method that is appropriate for metal and finish indicated and that develops full strength of members joined. Finish exposed welds and surfaces smooth, flush, and blended to match adjoining surfaces.
- D. Brackets, Fittings, and Anchors: Provide wall brackets, fittings, and anchors to connect ornamental grilles to other work, unless otherwise indicated.
  1. Furnish inserts and other anchorage devices to connect ornamental grilles to concrete and masonry work. Coordinate anchorage devices with supporting structure.

## **PART 3 EXECUTION**

### **3.1 INSPECTION**

- A. 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.



### 3.2 ERECTION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.
- B. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry, or similar construction.
- C. Fitting Connections: Fit exposed connections accurately together to form tight hairline joints. Weld connections which 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.
- D. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance, and quality of welds made, and methods used in correcting welding work.
- E. 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.
- F. 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.

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**SECTION 062000**

**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.
  - 2. Rough hardware.
  - 3. Installation only of finish hardware.
  - 4. Installation only of doors and hollow metal frames.

**1.3 RELATED SECTIONS**

- A. Roofing - Section 075323.
- B. Steel doors and frames - Section 081113.
- C. Finish hardware - Section 087100.

**1.4 QUALITY ASSURANCE**

- A. Lumber Standard: Comply with PS 20.
- B. Plywood Standard: Comply with PS 1 and American Plywood Assoc. (APA).
- C. Shop fabricate 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.

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- a. S-Dry: Maximum nineteen (19) percent moisture content as per ASTM D 2016.
  - b. 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.

### **1.5 SUBMITTALS**

- A. Pressure Treatment: Include certification by treating plant stating chemicals and process used, net amount of salts retained and conformance with applicable standards.
- 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.

### **1.6 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, "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 kept at all times under lock and key. The safety and preservation of all items delivered will be the responsibility of the Contractor.

**1.7 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 Commissioner.
- 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.

**B. Wood Treatment**

- 1. All interior wood material specified herein shall be fire retardant treated to comply with the AWP 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 AWP 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. For exterior blocking, roofing and sheet metal, pressure treat wood with copper azole, Type A (CBA-A); ammoniacal copper quat (ACQ) or similar preservative product that contains no arsenic or chromium. Preservative shall comply with AWP Standard C-2 for lumber and C-9 for plywood, (.25 lbs./cubic foot of chemical in wood).

- a. After treatment, kiln dry to a maximum moisture content of fifteen (15) percent. Treatment shall be equal to "Wolmanized Natural Select" made by Arch Wood Protection Inc. or approved equal.
3. Treated wood which is cut or otherwise damaged shall be further treated in accordance with the AWP Standard M-4.

## **2.2 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 Commissioner.

## **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 OF FINISH HARDWARE**

- A. Hardware shall be carefully fitted and securely attached, in accordance with these specifications and the instructions of the various manufacturers.
- B. Unless otherwise noted, mount hardware units at heights established in Section 081113.
- C. 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.
- D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units which are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- F. 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.
- G. 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 City of New York.
- H. 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.

### **3.3 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. 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.



3. 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.
4. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames conforming to the requirements of Section 072100, "Thermal Insulation."
5. 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.
6. 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.
7. 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.
8. 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.
9. Installation Tolerances: Adjust steel door frames for squareness, alignment, twist, and plumb to the tolerance given in HMMA 841 of ANSI/NAAMM, current edition.
10. Steel Doors: Fit hollow metal doors accurately in frames to the tolerances given in HMMA 841 of ANSI/NAAMM, current edition.
  - a. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
11. 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.

**3.4 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.

**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.

**C. Rough Lumber for Roofing and Sheet Metal**

1. Furnish and install all wood nailing strips and wood blocking required in connection with respective types of roofing, fans, flashings, and sheet metal work, using preservative treated wood as herein before specified.
2. Wood blocking shall be of sizes and shapes as indicated on the drawings and/or designed for the reception of curb flashings for roof ventilators and similar items.
3. All nailing strips and blocking shall be carried out in accordance with the printed installation instructions, and/or recommendations of the accepted manufacturer of the roofing materials, and in coordination and cooperation with the sheet metal work trades.

4. All blocking and nailing strips shall be firmly secured in place using counter bored bolt and nut fastenings, or secured by any other proposed flush surfaced fastenings.
5. Wood nailing strips or blocking required to be embedded in concrete work shall be furnished in time due for placing, prior to start of concrete operations. Locations and spacings of nailing strips or blocking shall be performed in coordination with the concrete trades, as required for respective installations.

### 3.5 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.

### 3.6 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**

**SECTION 062023**

**CABINETRY AND MILLWORK**

**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 cabinetry and millwork as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:
  - 1. Wood casework with wood veneer finish and hardwood edges.
  - 2. Cabinet hardware.

**1.3 RELATED SECTIONS**

- A. Carpentry - Section 062000.

**1.4 QUALITY ASSURANCE**

- A. The quality standards of the Architectural Woodwork Institute, "Architectural Woodwork Standards," 1<sup>st</sup> Edition, dated October 1, 2009, shall apply to all workmanship including materials and installation, for architectural woodwork and by reference are made a part of this specification. All work shall conform to "Premium" grade requirements of the AWI "Architectural Woodwork Standards," unless otherwise modified herein.
- B. Qualifications of Fabricators and Installers: For actual fabrication and installation of cabinetry and millwork, use only personnel who are thoroughly trained and experienced in the products involved and in the recommended methods for their fabrication and installation.
- C. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with "Quality Standards" of the Architectural Woodwork Institute (AWI) for the grades specified.

**1.5 SUBMITTALS**

- A. Shop Drawings: Before any cabinetry and millwork are fabricated and delivered to the job site, submit complete Shop Drawings to the Commissioner for approval.

- B. **Quality Certification:** Submit fabricator's certification stating that the fabricated work meets the woodwork grade specified and that the wood used is fire retardant treated in accordance with these specifications.
- C. **Samples:** Submit samples of all proposed materials to the Commissioner for the selection of actual colors and patterns.

**1.6 PRODUCT HANDLING**

- A. **Protection:** Use all means necessary to protect architectural woodwork 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 for the approval of the Commissioner and at no additional cost to the City of New York.
- C. **Delivery:** Do not deliver woodwork until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, woodwork must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

**1.7 JOB CONDITIONS**

- A. **Examination:** The installer must examine the substrates and conditions under which the work is to be installed, and notify the Contractor in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer and the Commissioner.
- B. **Conditioning:** Do not install woodwork until the required temperature and relative humidity have been stabilized and will be maintained in installation areas.

**PART 2 PRODUCTS**

**2.1 CABINETS AND MILLWORK**

- A. **General**
  - 1. Fabricate all cabinets and millwork to the "Premium" grade standards of the AWI, Section 400.
- B. **Plywood:** AWI Section 4; Veneer core, particleboard, or plywood core unless otherwise specified, and with the following requirements:
  - 1. **Hardwood:** Premium Grade, face veneers as shown or specified

2. Particleboard: Premium Grade; fire retardant for wall paneling only.
    - a. Particleboard: ANSI A208.1, Grade M-2
    - b. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.
      - 1). For panels 3/4 inch thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi; modulus of elasticity, 300,000 psi; internal bond, 80 psi; and screw-holding capacity on face and edge, 250 and 225 lbf, respectively.
      - 2). For panels 13/16 to 1-1/4 inches thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: modulus of rupture, 1300 psi; modulus of elasticity, 250,000 psi; linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf, respectively.
      - 3). Products: "Duraflake FR" by Flakeboard Company Limited, "Encore FR" by SierraPine, or approved equal.
  3. Particleboard and MDF shall be certified to the following EPP CPA 3-08 formaldehyde emission limits:
    - a. Particleboard meets 0.18 ppm.
    - b. MDF meets 0.21 ppm.
  4. Edges: Hardwood edges in accordance with Premium Grade Standards.
- C. Veneers
1. Face Veneers for Transparent Finish: AWI, Premium Grade of species of Quarter Sliced Red Oak. Veneer must be flitch matched, sequence matched, book matched, end matched and centered balanced.
- D. Finishing (Wood)
1. Transparent Finish for Casework
    - a. AWI Factory Finish System "Conversion Varnish", System 5, Transparent.
    - b. AWI Premium Grade.
    - c. Stain: As selected by Commissioner.
    - d. Degree of Sheen: As selected by Commissioner.

## **2.2 CABINET HARDWARE**

- A. General: Provide complete cabinet hardware and accessory material associated with cabinetry and millwork and as required for installation and operation of cabinets. Hardware design shall be as selected by the Commissioner.
- B. Hardware Standards: Comply with ANSI A156.9 "American National Standard for Cabinet Hardware." Quality Level: Type 2 (Institutional).
- C. Cabinet Door Hardware: Provide hinges, catches and pulls to properly accommodate each door size and style.
- D. Sliding Door Hardware: Provide sets including pulls, to properly accommodate each pair of sliding doors.
- E. Drawer Hardware: Provide slides and pulls to properly accommodate each drawer size and style. Equip each drawer with side mounted, full extension, ball bearing, nylon roller drawer slides.
- F. Locks: Provide standard pin-type or disc-type (5 pins or discs) tumbler locks, keyed individually except as otherwise indicated.
- G. Shelf Supports: Where shelving is indicated as "adjustable," provide slotted type needed to properly support the shelves with uniform forty (40) lbs. per square foot loading.
- H. Exposed Hardware Finish: Provide exposed hardware with BHMA Code 626 satin chrome plate finish (US26D).
- I. Glass Doors and Shelves: Clear plate or sheet glass; FS DD-G-451, Type I, 1/4" thick; which has been seamed at exposed edges, and tempered to 4 x normal flexural strength.

## **2.3 BUILT-IN CABINETS, WOODWORK WITH WOOD VENEER FINISH**

- A. Construction: Details of cabinet and wood work construction shall conform to design as detailed on the drawings and shall be constructed in accordance with AWI Section 10, Premium Grade.
- B. Finishing: All work shall be factory pre-finished. No field finishing will be permitted, except minor retouching that is necessary after installation to leave work in perfect condition. Field touch-up shall be accomplished using the same finishes as originally applied at the factory. All finishes shall be free from runs, sags and other visual defects. All wood shall be thoroughly hand smoothed and hand sanded to remove all traces of machine and tool marks. All steel or other metal components shall be deburred, thoroughly cleaned and degreased prior to finishing. Requirements for surface preparation shall be in accordance with AWI Standards specified. Surfaces shall be finished as follows:



1. Wood veneers shall be as specified herein, flitches to be selected by Commissioner. Veneer shall be minimum 1/28" thick.
  2. All wood veneer surfaces shall be given transparent finish as specified herein.
  3. Backing Veneer: Provide backing veneer, of same thickness and strength as face veneer for balanced construction, where plywood surface not exposed, not semi-exposed, or not to be finished. Note that interior surface of cabinets, closets, are to be finished.
- C. All edges shall be hardwood to match veneer.
- 2.4 FABRICATION - SPECIFIC ITEMS
- A. Casework
1. Include all preparations for mechanical, electrical, telephone and plumbing work required.
  2. Provide cabinet hardware for casework as shown.
  3. Provide dust panels in body webs and between drawer units.
  4. Provide wood veneers for exposed surfaces as specified herein before.
  5. Hollow core doors will not be permitted.
  6. Provide matching veneers for edge treatments of case body members where transparent finishes are indicated or specified.
  7. Provide drawers with slides as specified. Drawers shall not rest on web body frames.
  8. Provide wood veneers for transparent finish, of matching and continuing grain, for drawer and door edges.

### PART 3 EXECUTION

#### 3.1 INSPECTION

- A. Examine the areas and conditions where cabinetry and millwork 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 FABRICATION

- A. Fabricate all architectural woodwork in strict accordance with the approved Shop Drawings and the referenced standards.

**3.3 INSTALLATION**

- A. Install cabinetry and millwork in accordance with Section 1700 of AWI standards.
- B. Install the work plumb, level, true and straight, with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level (including countertops), and with 1/16" maximum offset in flush adjoining surfaces, 1/8" maximum offsets in revealed adjoining surfaces.
- C. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
- D. 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.
- E. Casework
  - 1. Install without distortion so that doors and drawers will fit openings properly and be accurately aligned.
  - 2. Adjust casework and hardware so that doors and drawers operate smoothly and with tolerances as established by standards. Lubricate operating hardware as recommended by manufacturer.
- F. Countertops: Anchor securely to base units and other support systems.

**3.4 PROTECTION**

- A. Cover casework with four (4) mils polyethylene film, for protection against soiling and deterioration during remainder of construction period.

**END OF SECTION**

**SECTION 072100**

**THERMAL INSULATION**

**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 thermal insulation as shown on the drawings and/or specified herein, including, but not limited to, the following:
  - 1. Insulation under slabs-on-grade.
  - 2. Miscellaneous blanket insulation.
  - 3. Attachment devices.

**1.3 RELATED SECTIONS**

- A. For insulation at roof, see Division 07 Roofing Sections.

**1.4 SUBMITTALS**

- A. Submit product data for each type of product indicated, including re-cycle content.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulation products.

**1.5 QUALITY ASSURANCE**

- A. 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.

**1.6 DELIVERY, STORAGE AND HANDLING**

- A. Deliver materials to the site ready for use in the manufacturer's original and unopened containers and packaging, bearing labels as to type and brand. Delivered materials shall be identical to approved samples.
- B. Store materials under cover in a dry and clean location, off the ground. Remove materials which are damaged or otherwise not suitable for installation and replace with acceptable materials.

- C. Take every precaution to prevent the insulation from becoming wet, cover with tarps or other weather/watertight sheet goods.

## **PART 2 PRODUCTS**

### **2.1 UNDER-SLAB INSULATION**

- A. Provide extruded polystyrene board insulation equal to "Styrofoam" manufactured by Dow Chemical Co., or approved equal made by Owens Corning or PACTIV Building Products, conforming to ASTM C 578, Type IV, with a maximum flame spread and smoke developed indices of 75 and 450 respectively.
- B. Insulation shall have an aged R value of not less than 5/inch; shall be 2" thick unless otherwise noted on the drawings.

### **2.2 BLANKET INSULATION**

- A. Provide flexible glass fiber blankets/batts equal to "Fiberglass Flame Spread 25 Insulation" as manufactured by Owens Corning or 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 3.5" thick unless otherwise noted on the drawings.

### **2.3 ACCESSORIES**

- A. Protection Board: Premolded, semi-rigid asphalt/fiber composition board, 1/4" thick, formed under heat and pressure, standard sizes.

## **PART 3 EXECUTION**

### **3.1 INSPECTION**

- A. Examine the areas and conditions where thermal insulation 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. General
  - 1. 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.

2. 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.
3. Discard, off the site 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.
4. 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.
5. 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.
6. Set vapor barrier faced units with vapor barrier to inside of construction, except as otherwise shown. Do not obstruct ventilation spaces. All joints in vapor barriers shall be sealed with 4" wide, foil faced duct tape to prevent vapor and air migration.
7. Tape joints and ruptures in vapor barriers, using tape specified above, and seal each continuous area of insulation to surrounding construction so as to ensure vapor tight installation of the units.

### 3.3 INSTALLATION OF UNDER-SLAB INSULATION

- A. Protect top surface of horizontal insulation (from damage during concrete work) by application of protection board.

### 3.4 INSTALLATION OF BLANKET OR BATT FIBERGLASS INSULATION

- A. Install blanket fiberglass insulation in largest pieces as practical with edges closely butted. Cut and fit insulation to closely fit intersecting or penetrating surfaces.
  1. Face vapor barrier towards warm side, tape joints with 4" wide vaporproof aluminum tape applied over vapor barrier.

**3.5 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.

**END OF SECTION**

**SECTION 072710**

**VAPOR PERMEABLE AIR BARRIER MEMBRANE**

**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 vapor permeable membrane as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:
  - 1. Vapor retarder/air barrier applied over sheathing at lightgauge metal frame construction.

**1.3 RELATED SECTIONS**

- A. Sheathing - Section 054000.

**1.4 SUBMITTALS**

- A. Product Cut Sheets for all materials as stated herein. Cut sheets shall indicate that the submitted products are the products installed in the project.
- B. Submit certification in writing indicating that sealant specified in Section 054000 for joints between sheathing panels is compatible with vapor barrier air barrier specified herein.

**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 MATERIALS**

- A. Membrane: "Wrapshield" by Proctor Group, Ltd., distributed by VaporShield, L.L.C., or equal made by W.R. Grace, Henry or approved equal.

## **2.2 UNDERLAYMENT PHYSICAL PROPERTIES**

- A. Thickness and Weight: 0.020 inches thick and 5.014 oz./ sq. yd.
- B. Water Vapor Transmission: 80 perms per ASTM E 96-00, Method B (as tested by CNRC).
- C. Water Penetration Resistance: 55 cm per ATTCC-127.
- D. Surface Burning Characteristics: ASTM E 84-97A.
  - 1. Flame Spread: Class A
  - 2. Smoke Developed: Class A
- E. Color: Black.

## **2.3 AUXILIARY MATERIALS**

- A. Underlayment Flashing Rolls: VaporFlashing and VaporFlashing Factory Formed Corners for use in wrapping openings, distributed by VaporShield L.L.C.
  - 1. Factory Formed Corners: VaporFlashing Factory Formed Corners 18" x 18", distributed by VaporShield L.L.C.
  - 2. Small Penetration Flashing: As manufactured by Quick-Flash Inc.
- B. Tape
  - 1. Single-Sided Tape: 4" VaporTape (Seam-Seal) for use to secure Wrapshield to itself and to substrates, distributed by VaporShield L.L.C./Manufactured by Eternabond.
  - 2. Double-Sided Sealing Tape
    - a. 1" VaporTape (Double-Sided) for use to seal Wrapshield to itself and to substrates, distributed by VaporShield L.L.C./Manufactured by Eternabond.
    - b. One-inch-wide butyl rubber tape, subject to approval of the Commissioner.
- C. Fasteners: Minimum No. 12 gauge corrosion-resistant steel or stainless steel nails having a minimum 3/8-inch diameter head, or minimum No. 14 gauge corrosion-resistant steel or stainless steel nails having a 1-inch-diameter caps, or minimum No. 16 gauge stainless steel staples having minimum 7/16-inch crowns.



### **PART 3 EXECUTION**

#### **3.1 INSPECTION**

- A. Examine the areas and conditions where the vapor permeable membrane 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 have been corrected to permit proper installation of the work.

#### **3.2 SURFACE PREPARATION**

- A. All surfaces must be sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants.

#### **3.3 PENETRATIONS**

- A. Pipes and Conduit: Install manufactured penetration sleeves sized for the penetration and installed as recommended by the manufacturer.
- B. Windows
  - 1. Secure prefabricated VaporFlashing Factory Formed Corners at window sill ends. Next, lay strip of breathable underlayment across sill. Secure with tape or mechanical fasteners so that the underlayment used for the wall can be slipped underneath the corners and sill, allowing for a minimum lap of 4 inches.
  - 2. Wrap a strip of breathable underlayment around jambs extending horizontally along walls a minimum of 9 inches.
  - 3. Secure VaporShield Factory Formed Corners at ends of window head. Next, lay strip of breathable underlayment across the opening, extending horizontally beyond the corners a minimum of 6 inches.
    - a. Cut underlayment along the leading edge of the header an inch or two beyond each jamb, so that the nailing flange of the window may side up behind the underlayment.
- C. Doors: Wrap a strip of breathable underlayment around jambs, extending horizontally along walls a minimum of 9 inches.
  - 1. Secure VaporShield Factory Formed Corners at ends of door head. Next, lay strip of breathable underlayment across the opening, extending horizontally beyond the corners a minimum of 6 inches.
  - 2. Cut underlayment along the leading edge of the header, an inch or two beyond each jamb, so that the nailing flange of the door may side up behind the underlayment.
- D. Seal all other penetrations with termination mastic, liquid membrane, sealant or other procedures in accordance with manufacturer's instructions.

**3.4 BREATHABLE UNDERLAYMENT APPLICATION**

- A. Install membranes in accordance with manufacturer's instructions over exterior sheathing. Secure the underlayment so that the subsurface is protected from weather until cladding can be installed.

**3.5 PROTECTING AND CLEANING**

- A. Protect installed breathable underlayment from damage due to ultraviolet light, harmful weather exposures, physical abuse, and other causes. Manufacturer suggests a maximum of four (4) months UV exposure.
  - 1. Repair torn breathable underlayment as follows:
    - a. Insert a full height piece of underlayment extending 12 inches horizontally beyond the damage and extend up and under the underlayment above. Mechanically attach underlayment to substrate top and bottom.
  - 2. Remove mud and similar marks with a water scrub. If chemicals have been spilled on underlayment, treat as a tear and repair as stated above.

**END OF SECTION**

**SECTION 074213**

**METAL PANELS**

**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 metal panels as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:
  - 1. Corrugated metal siding with factory applied finish.
  - 2. Sub-girts, trim, feature strips and accessories required for complete installation.
  - 3. Sealant in conjunction with metal siding work.

**1.3 RELATED SECTIONS**

- A. Exterior ceramic tiling - Section 093000.

**1.4 QUALITY ASSURANCE**

- A. 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.

**1.5 PERFORMANCE CRITERIA**

- A. Structural Design: Design calculations, certified by a registered professional engineer, licensed in New York, shall be submitted to verify load carrying capability of panel system. Panel system shall be capable of resisting a minimum positive and negative wind load as specified in Section 093000 with a deflection of L/180.
- B. Air Infiltration: The panel system shall be tested for static air infiltration in accordance with ASTM E 283. The maximum allowable leakage shall be .06 CFM/FT<sup>2</sup> at a positive pressure differential of 1.57 psf.
- C. Water Penetration: No uncontrolled water shall occur when the panel system is subjected to a static water infiltration test per ASTM E 331 at a positive pressure differential of 6.24 or 20% of the design wind pressure, whichever is greater.

**1.6 SUBMITTALS**

- A. **Manufacturer's Data:** Submit standard detail drawings and installation instructions for preformed metal siding. Include manufacturer's certification or other data substantiating that the materials and finishes comply with the requirements. Indicate by copy of transmittal that the Installer has received a copy of the installation instructions.
- B. **Samples:** Submit twelve (12) inch long by full width samples of preformed metal siding, complete with factory applied finish. Samples will be reviewed by Commissioner for pattern, texture and color only. Compliance with other requirements is the exclusive responsibility of the Contractor.
- C. **Shop Drawings:** Submit shop drawings showing the profiles of preformed metal siding units, and the details of forming, jointing (gaskets, if any), internal supports, anchorages, trim, flashing, and accessories. Show details of weatherproofing at edges, terminations, and penetrations of the metal siding work. Show small scale layout and elevations of entire work.
- D. **Engineering Data:** Submit engineering and test data and tables showing performance characteristics of the panels for loads, deflections and infiltration of air and water meeting standards specified herein.

**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 WARRANTY**

- A. Exterior panel finish shall be warranted for a period of ten (10) years against failures of any kind.
- B. Wall system shall be warranted for a period of five (5) years against failures of any kind.

**1.9 COORDINATION**

- A. Contractor must carefully coordinate his work with work of other trades that are penetrating through, or connecting to the metal siding. Openings required in siding to accommodate penetrations must be neatly and accurately made in the shop prior to job site delivery.
- B. Provide concealed reinforcing plates, anchors and supports to receive items mounted on siding as required to prevent deflection of siding.
- C. Provide all necessary trim, flashing, sealant as specified herein to insure watertight integrity of siding where penetrations occur.

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURER**

- A. Provide steel wall panel system as specified herein. The profiles and gauges of panel sections and methods of interconnecting shall be as required to provide a combined action as a wall system to resist a minimum wind load of 30 psf (or greater if required by Code) without exceeding a deflection of L/180. Trade names used herein are those of Reynolux (Alcoa Architectural Products); equivalent materials manufactured by Centria, Morin Corp., or approved equal shall be acceptable.

### **2.2 MATERIALS**

- A. Wall Assembly: Field assembled wall system shall consist of an exposed fastener exterior face and sub-girts anchored to steel stud back-up. The exterior face shall be fastened to the sub-girts with exposed screw fasteners.
- B. Panels
1. Face panel shall be roll formed "1/4" Corrugated," 1/4" depth, 42.67" coverage width, fabricated from 6063-T52 aluminum, 0.050" thick.
  2. High-Performance Organic 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.
    - a. Abrasive blast per SSPC SP-7/ NACE 4 "Brush-Off Blasting" removing a passivator that may be present and obtaining a surface profile of 1.0 to 2.0 mils. Insure that a passivator is not present.
    - b. Primer Application: Apply Corafon™ ADS Wash Primer ADS225/ADS 226 @ 0.3-0.5 Mils dry film thickness (DFT). Allow the primer to cure a minimum of 2 hours prior to top coating.
    - c. Intermediate Application: Apply one coat of Corafon™ ADS High Build Epoxy Primer/Intermediate ADS.
    - d. Full cure will be achieved in three to five days.
  3. Color shall be custom color and gloss (bright yellow) as selected by the Commissioner. Color samples shall be submitted and approved prior to application of color coating.
- C. Sub-Girts: Metal sub-girts shall be formed from eighteen (18) gauge hot dip galvanized steel. Sub girts shall be of the adjustable type and shall conform to ASTM A 653 SQ, Grade 37, G90 coating.
- D. All exterior flashing shall be fabricated in the same material, gauge, finish, and color as the exterior profile, unless otherwise noted.

- E. Exterior panels shall be fastened with exposed No. 14 stainless steel self-tapping and sheet metal screws with combination washers for the corrugated panels. All fastener heads shall be factory color coated to match the exterior panels.

## **2.3 ACCESSORIES**

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653, G90 coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Wall panel system fasteners shall be #14 minimum diameters, self-tapping, with hex head.
  - 1. Exposed fasteners shall be 300 series stainless steel with 5/8" bonded neoprene and stainless steel washers coated to match the exterior panel color.
- C. Closures shall be metal and/or foam as required. Foam shall be a pre-cut profile closure of closed cell foam. Metal closures shall be fabricated from the same materials, gauge, finish, and color as the exterior metal panel.
- D. Sealants
  - 1. Hidden sealant at all side laps, end laps, and flashing details shall be gun grade non-curing butyl or polymeric non-skinning butyl tape to ensure weather tightness.
  - 2. Exposed sealant shall be one-part moisture-curing, gun grade silicone meeting requirements of Section 079200.

## **2.4 FABRICATION**

- A. Comply with dimensions, profile limitations, gauges and fabrication details shown and specified.
- B. Fabricate components of the system at factory, ready for field assembly.
- C. Fabricate components and assemble units to comply with performance requirements specified.
- D. Apply specified finishes in conformance with manufacturer's standards, and according to coating manufacturer's instructions.

### **PART 3 EXECUTION**

#### **3.1 INSPECTION**

- A. Examine the areas and conditions where metal panels 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. General: Comply with panel manufacturer's instructions for assembly, installation and erection of preformed metal siding.
- B. Metal Separation: Apply a coat of bituminous paint, concealed, on one or both surfaces wherever dissimilar metals would otherwise be in contact. Use gasket fasteners where needed to eliminate the possibility of corrosive or electrolytic action between metals.
- C. Anchor sub-girts to stud or CMU back-up spacing sub-girts not to exceed 16" o.c. unless closer spacing required to meet deflection criteria. Use stainless steel anchors to fasten sub-girts to stud framing or CMU; space anchors 8" o.c. at each stud and 8" o.c. at CMU back-up.
- D. Erect panels plumb, level and true to line with tolerances not exceeding 1/16" in runs of 20' and within 1/16" of adjoining faces.
- E. Ceiling Panels: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to lightgage metal framing supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
- F. Fasteners: Provide a concealed fastener installation system, with no fasteners exposed on face of work.
- G. Joint Sealers: Install gaskets, joint fillers and sealants where required for weatherproof performance of panel systems. Provide types of gaskets and sealants/fillers recommended by panel manufacturer.
- H. Damaged Material: Remove and replace panels and component parts of the work which have been damaged (including finish) beyond successful repair, as directed by the Commissioner. Repair minor damage.

#### **3.3 CLEANING AND PROTECTION**

- A. Clean exposed surfaces (exterior and interior) of preformed metal siding work promptly after completion of installation. Comply with recommendations of both the panel and coating manufacturer.

**HARPER STREET YARD**  
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- B. Protection: The Installer of preformed metal siding shall advise the Contractor in writing of protection and surveillance procedures which can be foreseen as needed to ensure that the work will be without damage or deterioration at the time of final acceptance after completion of other construction work.

**END OF SECTION**



**SECTION 075000**

**EXISTING ROOF WORK**

**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 roof work, including, but not limited to, the following:
  - 1. Cutting and patching existing membrane roofing system to accommodate new penetrations.
  - 2. Roof insulation as required.
  - 3. New roof board.
  - 4. Partial removal and replacement of asphalt shingle roofing.

**1.3 RELATED SECTIONS**

- A. Structural steel - Division 5.
- B. Aluminum gutters and downspouts - Section 077100.
- C. Plastic unit skylights - Section 086200.
- D. Mechanical penetrations - Division 23.

**1.4 QUALITY ASSURANCE**

- A. Have work done by a single firm with at least 3 years' successful experience in comparable work, and which is approved by the City of New York and the manufacturer of roofing materials. Use only experienced personnel skilled in operations needed, working under competent supervision. Roofing specialist shall perform specified examinations and submit detailed recommendations concerning methods and materials to be used in making repairs to the Commissioner through the Contractor.
- B. Before starting work, test proposed materials for compatibility with existing materials by installing each in a small area in location of roof opening. Do not proceed until Commissioner approves tests.
- C. Do all work so that existing in force warranty (if any) shall remain in effect; coordinate work with the City of New York and roof membrane manufacturers.

## **HARPER STREET YARD**

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### **1.5 PROJECT CONDITIONS**

- A. Protect existing finishes. Do not hoist materials against building faces without adequate approved protection from grade to parapet. Protect vegetation and paving from damage due to roofing and flashing work. Completely remove bituminous materials from surfaces other than built-up roofing and bituminous flashings.
- B. Do not use incompatible materials or materials that are not compatible with existing materials.
- C. Do not uncover existing insulation until ready to do repair Work and install new insulation and covering Work.
- D. Avoid unnecessary traffic over roof areas. Use roof areas to perform Work only where unavoidable. When roof areas must be used, protect roof and flashing from damage; use temporary plywood sheets where traffic is mandatory; lay continuously at every traffic pattern and Work area.
- E. Should field conditions differ significantly from those shown on drawings, notify Commissioner in writing and do not proceed without instructions from the Commissioner.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- A. Contractor shall be advised of the following existing roof systems, related components and work required.
- B. Roof Materials: New materials to match and be compatible with existing materials; coordinate with the City of New York and roof membrane manufacturers. Contractor shall coordinate work with roof membrane manufacturers to insure continuity of warranty and shall submit written authorization from the roof manufacturers stating that all work has been done in accordance with procedures that allow warranty to remain in effect.
- C. Asphalt Shingles, UL Class "A" Heavy Weight: Mineral-surfaced, self-sealing asphalt fiberglass strip shingles to match existing asphalt shingles, and complying with ASTM D 3018, Type 1, ASTM E 108 and ASTM D 3161, Class F Wind Resistance. Provide shingles bearing UL Class "A" external fire exposure label and UL "Wind Resistant" label.
- D. Roof Insulation: Flat and tapered, type to match existing.
- E. Penetration Seal: M-Curb System, consisting of a preformed structural urethane outer shell filled with a two-part urethane rubber sealant such as M-Thane. A structural high viscosity urethane adhesive such as M-Bond shall be used to bond the shell to the roof deck as well as seal the edges.

- F. Penetration Flashing and Low Flashing: Applied Liquid Technologies' "Protec" system, consisting of glass fiber fabric reinforced two-component polyester resin membrane.
- G. Roof Board: "DensDeck" by Georgia Pacific in thickness as indicated on drawings, but not less than 1/4".
- H. Stainless Steel Flashing: ASTM A 167, Type 304, stainless steel with 2D finish, dead soft temper, fully annealed, as manufactured by International Nickel Co., Republic Steel Corp., United States Steel, Washington Steel Corp. or approved equal. Thickness of stainless steel shall be as listed below.
  - 1. Concealed Flashings: 0.012" thick, thirty (30) gauge (U.S. Standard).
  - 2. Exposed Flashings: 0.015" thick, twenty-eight (28) gauge (U.S. Standard).
  - 3. Edge Strips: 0.025" thick, twenty-four (24) gauge (U.S. Standard).

### **PART 3 EXECUTION**

#### **3.1 INSPECTION**

- A. Examine the areas and conditions where roof work is to be installed and notify the Commissioner of 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 ROOF DECK BOARD**

- A. Install in accordance with manufacturers requirements, fasteners and fastening pattern to achieve ratings as required by Code.

#### **3.3 ROOF INSTALLATION**

- A. Repair roofing and associated insulation and flashings on the roofing where new cutting and patching is required.
- B. Where existing roofing, insulation, or flashings, are damaged during the Work, satisfactorily repair, flash, and otherwise make watertight at least equal to condition when Work began. If damage cannot be satisfactorily repaired, remove damaged portion and provide new materials as appropriate. Do such Work and repairs at no additional cost. Materials, methods, and completed Work are subject to approval of the City of New York, Commissioner, and roof membrane manufacturer.
- C. Protect edges, incomplete flashings, and cut existing roofing against water entry at all times.
- D. Where practicable, unless otherwise recommended by roofing specialist or materials manufacturers, use materials, systems, quantities, and methods that exactly match existing and keep existing warranty (if any) in effect. Materials used shall be compatible with each other and with existing materials.

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- E. Make all repairs watertight.
- F. Do not remove materials to the extent that the building is subject to water intrusion without providing approved protection. Do not remove more area of existing surfaces that can be repaired in the same working day.

**END OF SECTION**

**SECTION 075323**

**MEMBRANE ROOFING AND ROOF INSULATION**

**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 membrane roofing and roof insulation as shown on the drawings and/or specified herein, including, but not limited to, the following:
  - 1. EPDM sheet membrane roofing, fully adhered.
  - 2. Rigid roof insulation below roof membrane.
  - 3. Sheet flashing.

**1.3 RELATED SECTIONS**

- A. Carpentry - Section 062000.
- B. Sheet metal flashing - Section 076200.
- C. Drains and vents - Divisions 22 and 23.

**1.4 DESCRIPTION OF THE SYSTEM**

- A. The membrane roofing system specified herein shall consist of factory fabricated large sections of sheet membrane fully adhered over the rigid roof insulation. Provide flashing at roof penetrations and vertical surfaces.

**1.5 QUALITY ASSURANCE**

- A. Qualifications
  - 1. The membrane roofing system specified herein shall be the product of a manufacturer who can furnish supporting evidence of experience in the manufacture of the membrane roofing system and of having been regularly engaged in this business for not less than five (5) years. Such experience shall be in projects similar to the requirements and scope for this project.

2. The details and specifications are based on a particular manufacturer. It is not the intention of this specification to restrict competition. If a manufacturer other than the one specified is selected, it shall be his obligation and responsibility to modify and adjust his materials to suit the encountered conditions and to consult and coordinate his work with other trade Contractors to assure that the installation will be watertight and function for use intended and that the guarantee will be issued to the City of New York.
3. Acceptable manufacturers:
  - a. Carlisle Syntec Incorporated ("Sure-White," basis of design).
  - b. Firestone Building Products Company.
  - c. Versico Inc.
  - d. or an equal acceptable to the Commissioner.
- B. The Contractor or Subcontractor performing the work of this Section must, within the last five (5) consecutive years prior to the bid opening, have successfully completed in a timely fashion at least three (3) projects similar in scope and type to the required work. In addition for roofing work, the contractor or subcontractor must be licensed or approved by the manufacturer of the roofing system.
- C. UL Listing: Provide system which has been tested and listed by UL for application indicated and which has a "Class A" rating.

**1.6 SUBMITTALS**

- A. The samples and certificates listed below are required to be submitted by the Contractor to the Commissioner, for review. An omission of an item or items does not relieve the Contractor from this responsibility and for compliance with the Contract Documents, of which this is a part.

**1. Samples**

Item No.	Size	Description
a. S1	6" x 6"	Membrane w/splice
b. S2	6" x 6"	Rigid insulation
c. S3	6" x 6"	Flashing materials
d. S4	6" x 6"	Walkway material
e. S5	24" x 24"	Precast concrete paver

**2. Notarized Certificates of Compliance**

Item No.	Description	Standard
a. C1	Sheet membrane	As specified
b. C2	Submit manufacturers published specifications, which completely describe the preparation of surfaces and application of roofing systems.	

- c. C3 Submit a letter from membrane manufacturer issuing sample guarantee and approving the applicator, prior to pre-application conference.
- B. Submit complete shop drawings showing details, dimensions, fabrication and fastening elements for each condition encountered, layout of each sheet noting seam locations, perimeter and penetration flashing, and other details where roofing abuts other materials and/or conditions.
- C. Submit copies of pre-roofing conference records.
- D. Submit a letter signed by the manufacturer and Contractor acknowledging that the submitted roofing system complies with ASCE-7 and FM 1-90 for wind speed code requirements based on height and geographic location of project.

**1.7 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Deliver materials to the site ready for use in the manufacturer's original and unopened containers and packaging, bearing labels as to type and brand. Delivered materials shall match approved samples. Fire classification labels shall be intact and visible.
- B. Store materials under cover in a dry and clean location, off the ground, and remove materials which are damaged, torn, or otherwise not suitable for installation and replace with acceptable materials.
- C. Keep insulation and membrane dry before and during installation. Remove wet materials from project site.
- D. Store roofing materials on platforms or pallets, above ground, on roof level and cover with tarpaulins or on other suitable watertight covering. Store membrane and handle, in such a way as to prevent damage to edges or ends.

**1.8 PREROOFING CONFERENCE**

- A. Prior to ordering of materials, and only after approval of submittals, a pre-roofing conference will be held to discuss the specified roofing system and its proper application. Conference shall include installer, roofing manufacturer, installers of related work, Commissioner and representatives of City of New York. Record discussions and agreements and furnish copy to each participant. Provide at least 72 hours advance notice to participants prior to convening conference.
- B. Coordinate application of the roofing system in such a manner that the complete installation is weather-tight and in accordance with guarantee requirements.

**1.9 ENVIRONMENTAL REQUIREMENTS**

- A. Work shall not be installed when the roof deck is damp, wet or spotted with frost or if the ambient temperature is 35 deg. F. and falling or if there is a forecast for inclement weather which will be adverse to the proper installation of the roofing system.

**1.10 GUARANTY**

- A. The Contractor shall promptly repair, replace, restore or rebuild, as the Commissioner may determine, any finished Work in which defects of materials or workmanship may appear or to which damage may occur because of such defects, during the two (2) year period subsequent to the date of Substantial Completion (or use and occupancy in accordance with the Contract),

**1.11 WARRANTY**

- A. The warranties specified under this Article shall not deprive the City of New York of any remedies as stated within the Contract Documents.
- B. Special Project Warranty: Provide written warranty, signed by Manufacturer of primary roofing materials, flashings, base flashings, all roof components and his authorized Installer, agreeing to replace/repair defective materials and workmanship as required to maintain roofing system in watertight condition.
- C. Warranty period for manufacturer is twenty (20) years; no dollar limit.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- A. Membrane Sheets: 0.060" thick, non-reinforced EPDM (Ethylene Propylene Diene Monomer) compounded elastomer. Membrane shall be fully adhered; refer to Part 3.2,C of this specification section.
  - 1. Color of Membrane
    - a. At Monitoring Booth Roof: White-on-black.
    - b. At Gutter Area: Black.
- B. Membrane Flashing: 0.060" thick uncured EPDM; or as recommended by roofing manufacturer.
- C. Bonding Adhesives, Mastics and Splicing Cement: Compatible with the materials with which they will come in contact.
- D. Lap Sealant: For sealing the exposed edge of the splices and as otherwise required shall be of a consistency recommended by the manufacturer.



- E. Prefabricated Pipe Seal Assemblies: Provide assemblies to accommodate vents, pipe penetrations and other similar roof penetrations. Provide prefabricated split pipe seals, square tubing wraps and curb wrap corners.
- F. Sealers: Provide sealers and other similar accessory materials as recommended by the manufacturer.
- G. Materials: The materials provided shall be part of a roofing system developed by the approved manufacturer and shall in every respect be compatible with each other and with the substrates and conditions encountered in the field.
- H. Cant Strips, Tapered Edge Strips, and Flashing Accessories: Types recommended by membrane manufacturer, including adhesive tapes, flashing cements, and sealants.
- I. Membrane Adhesive: As recommended by membrane manufacturer for particular substrate and project conditions, formulated to withstand ASCE 7-02 wind uplift force requirements of the geographic area of the building.
  - 1. Provide adhesives that comply with local requirements limiting amounts of volatile organic compounds.
- J. Vapor Retarder: Reinforced polyethylene film conforming to ASTM D 4397, 8 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.
- K. Roof Insulation: Minimum 4" thick (total) flat and tapered (1/4" per foot) polyisocyanurate board roof insulation conforming to ASTM C 1289, faced with proper facing to allow membrane to be adhered to it without delamination. Roof insulation must have an LTTR R-Value of 6.0/inch at 75 deg. F. when tested in accordance with ASTM C 1303.
  - 1. Manufacturer of roofing system must approve use of insulation in writing in advance.
- L. Cover Board: Provide "Dens-Deck Roof Boards" by Georgia-Pacific Corporation ASTM C 1177, glass-mat, water-resistant gypsum substrate, or equal by National Gypsum, USG or approved equal of thickness as indicated on drawings.
- M. Walkway Pads: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads, approximately 3/16-inch thick, and acceptable to membrane roofing system manufacturer.

**PART 3 EXECUTION**

**3.1 INSPECTION**

- A. Examine the areas and conditions where roofing 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. Nailers**

1. Continuous pressure treated (See Section 06200) nailers shall be firmly anchored to resist a force of 75 pounds per lineal foot in any direction. The thickness of the nailer shall be such that the top of the nailer is flush with the surface to which the membrane is attached at the horizontal plane.
2. Nailers shall be installed continuous at perimeters and around all roof penetrations unless otherwise noted.
3. Wood Nailer Securement: Wood nailers shall be attached with No. 10 galvanized screws in conjunction with galvanized steel washers (minimum 5/8 inch outside diameter) using a staggered fastening pattern in two rows at 24 inches apart. Within eight feet of outside corners, the staggered fastening pattern shall be increased to a maximum 12 inches on center in each row. When additional wood nailers are required, they must be attached with galvanized screws and washers that penetrate into the bottom wood nailer at 1-1/4 inches using a staggered fastening pattern in two rows at 24 inches on center in addition to the enhanced fastening pattern within eight feet of outside corners. Contractor shall examine existing wood nailers to remain to determine if existing wood nailers are attached in compliance with the above criteria. If not, existing wood nailers shall be refastened in accordance with the fastening requirements noted above.

- B. Vapor Retarder: 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. Continuously seal side and end laps with tape.

**C. Insulation**

1. Clean deck prior to installation of the insulation. Adhere insulation to deck using cold-applied adhesive, to meet F.M. I-90 minimum and ASCE 7-02 wind uplift requirements, including greater requirements for corners and perimeters as required. For tapered insulation, follow pattern of taper to insure correct pitch.

2. Moderately butt end joints over flutes, stagger joints in adjacent boards. Do not install more insulation in any one day than can be covered by the membrane roof sheets.
  3. Where two layers of insulation are required, stagger joints 2 feet in length and width in both directions.
  4. Neatly cut around all projections encountered and at abutting vertical surfaces. Where large gaps occur fill with a urethane foam pack.
- D. Sheet Membrane Application (Fully Adhered): Where required by manufacturer, install membrane by unrolling over prepared substrate, lapping adjoining sheets. Apply adhesive to surfaces to be bonded and roll into place when adhesive has properly cured. Treat seams with cleaner and prime finish with 4" seam tape and apply sealant to exposed sheet edges, tapering application as recommended by manufacturer. Install mechanical fasteners, flashings and counterflashings, and accessories at locations indicated and as recommended by manufacturer.
- E. Splicing
1. Fold the top sheet back about 12" and clean both mating surfaces at the splice area using clean rags with membrane manufacturer's recommended cleaner.
  2. Apply the in-seam tape primer with a synthetic scrub pad at a rate of 375 lineal feet of 5" splice per gallon. Allow tape primer to dry to the touch.
  3. Roll the top sheet toward the splice area until the cemented area is nearly touching the cement on the bottom sheet along the entire length of the splice. Allow the top sheet to fall freely into place avoiding stretching and wrinkling. Roll the splice with a 2" wide steel roller, using positive pressure, toward the outer edge of the splice.
  4. Solvent clean the splice edge, extending at least 1" onto the top and bottom membranes. Apply a bead of lap sealant completely covering the splice edge, feathering the lap sealant with a preformed putty knife or trowel.
  5. Lap sealant application shall be completed on all splices by the end of each working day.
- F. Membrane Flashing
1. Perimeter flashing and flashing around vents and other roof penetrations shall be preformed using the recommended flashing, compatible with the approved roofing system and utilizing the longest pieces practicable.
  2. The splice between the flashing and the main roof sheet should be completed before bonding the flashing to the vertical surface. Seal this splice at least 3" beyond the fasteners which attach the membrane to the horizontal nailer.

3. Bonding adhesive shall be applied to both the flashing and the surface to which it is being bonded. After the adhesive has dried to the point where it does not string or stick to a dry finger touch, roll the flashing into the adhesive. Take care to assure that the flashing is not bridging where there is any change of direction of the flashing (e.g., where the parapet meets the roof deck).

**G. Pipe Flashing**

1. Flashing for pipes, conduits and other similar items which are scheduled to penetrate (pass through) the membrane shall be provided with factory prefabricated elements when such use is possible. When prefabricated devices are not possible, field fabricated seals shall be used.
2. Bases of the pipe seals shall be spliced to the membrane roofing sheet as specified above for sheet laps and the top portion shall be secured to the pipe with a stainless steel clamping ring and continuously sealed with sealant in a watertight manner.
3. Field fabricated pipe seals shall be fabricated with base and cap membrane flashing which shall be spliced to the membrane and to itself and continuously sealed with sealant in a watertight manner.

- H. Drains:** At drain locations, where the insulation is tapered to form a smooth transition from roof surface to membrane, the membrane sheet shall be accurately cut-out so as to fit the encountered clamping ring, and shall be secured to the ring with the addition of the approved mastic in a secure, neat and watertight manner.

**I. Curbs, Corners**

1. Field fabricated outside corners shall consist of approved membrane flashing which shall have not less than 6" horizontal legs which shall be spliced to the roof membrane, and vertical legs as required which shall be nailed at 12" o.c. maximum. Corners shall be lapped a minimum of 3" and be secured by splicing to each flashing section
2. Field fabricated inside corners shall consist of approved membrane flashing with 6" horizontal legs which shall be spliced to the roof membrane, and vertical legs as required which shall be nailed at 12" o.c. maximum. Corners shall be lapped a minimum 6" and secured by splicing to each flashing section.
3. Install lap type sealant along all seams to insure a watertight installation.

- J. Daily Seal:** Care should be exercised to ensure that the water does not flow beneath any completed sections of roof. Temporarily seal loose edge of membrane with sealant when weather is threatening.

1. Mix the two components thoroughly according to the instructions on the label.

2. Apply the sealant at a rate of 100 lineal feet per gallon, on smooth surface, 12" back from edge of sheet onto exposed substrate surface. If necessary, use a trowel to spread material in order to achieve complete seal.
  3. After embedding membrane in sealant, check for continuous contact. Then weight the edge, providing continuous pressure over the length of the cutoff. The recommended weight for the continuous pressure is a 10 foot length of 2-1/2" tubing filled with dry sand.
  4. When work is resumed, pull sheet free before continuing installation.
- K. Walkway Pads: Install walkway pads in locations indicated; adhere to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

### **3.3 CLEANING AND PROTECTION**

- A. From time to time during the progress of the work and at the completion of the work, remove all rubbish, debris, dirt, equipment and unused materials from the site. Clean adjoining surfaces which may have been soiled by roofing work.
- B. Protect installed roofing from damage and abuse by other trades. Repair damages to watertight conditions at no additional cost to the City of New York.
- C. Exercise care to protect installed work. Work which does become damaged in any way or is not watertight, shall be repaired and/or replaced as directed to the satisfaction of Commissioner and/or City of New York at no additional cost or time.

**END OF SECTION**

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**SECTION 076200**

**SHEET METAL FLASHING**

**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 sheet metal flashing, as indicated on the drawings and/or specified herein, including, but not limited to, the following:
  - 1. Stainless steel cap metal flashing.
  - 2. Field fabricating (including bending, cutting, soldering, etc.), if required, of stainless steel flashing.
  - 3. Stainless steel flashing elsewhere, where metal flashing is indicated on drawings.
  - 4. Separation of contacting surfaces of dissimilar metals.

**1.3 RELATED SECTIONS**

- A. Roofing - Section 075000.

**1.4 SUBMITTALS**

- A. Shop Drawings: Submit, showing all materials, finishes, fastenings, joint details, fabrication, construction and relation to adjoining construction.
- B. Samples: Submit 12" x 12" samples of flashing materials and finishes.

**1.5 GUARANTY**

- A. The Contractor shall guarantee that all Metal Flashing Work executed under this Section will be free from defects in materials and workmanship for a period of two (2) years from date of acceptance of the Project, and he shall remedy any defects in the Metal Flashing Work.

**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 at no additional cost to the City of New York.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

#### **A. Stainless Steel Flashing Materials**

1. Stainless Steel Flashing: ASTM A 167, Type 304, stainless steel, with 2D finish, dead soft temper, fully annealed, as manufactured by International Nickel Co., Republic Steel Corp., United States Steel, Washington Steel Corp. or approved equal. Thickness of stainless steel shall be as listed below.
  - a. Concealed Flashings: 0.012" thick, thirty (30) gauge (U.S. Standard).
  - b. Exposed Flashings: 0.015" thick, twenty-eight (28) gauge (U.S. Standard).
  - c. Edge Strips: 0.025" thick, twenty-four (24) gauge (U.S. Standard).
2. Accessories and Fastenings: AISI, Types 302 and 304 stainless steel.
3. 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.
4. Flux: An acid type flux manufactured specifically for soldering stainless steel, as approved.

- B. 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.

## **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. Reference Standard: Conform to the requirements of 5th Edition of the Sheet Metal and Air Conditioning Contractors Association (SMACNA) Architectural Sheet Metal Manual.



- B. General: 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.
- C. 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.
- D. 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.
- E. 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.
- F. 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.
- G. 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.
- H. 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.

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- I. Miscellaneous Flashing: Provide all other miscellaneous metal flashing not specifically mentioned herein, but indicated on drawings and/or required to provide a watertight installation.
- J. Separation of Dissimilar Materials: Back paint surfaces of metal flashing in contact with dissimilar metals or with concrete or masonry with bituminous paint.

END OF SECTION

**SECTION 077100**

**ROOF SPECIALTIES AND 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 SECTION INCLUDES**

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the roof specialties and accessories as shown on the drawings and/or specified herein, including but not necessarily limited to the following:
  - 1. Stainless steel rainspout at monitoring booth.
  - 2. Stainless steel built in gutter at the M&R building and monitoring building.
  - 3. Stainless steel coping and flashing.
  - 4. Aluminum fascia.

**1.3 RELATED SECTIONS**

- A. Roofing - Section 075000.
- B. Sheet metal flashing - Section 076200.

**1.4 SUBMITTALS**

- A. Before any roof specialties and accessories are delivered to the job site, submit shop drawings showing profiles and anchoring devices.

**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 ALUMINUM FASCIA**

- A. Provide aluminum fascias fabricated of formed aluminum, 0.078" thick, alloy 5005-H154, smooth, no pattern.
- B. Provide UL-90 assembly rated fastener clips, of same material as copings.
- C. High-Performance Organic 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 Three-Coat System: Manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605-98 equal to "Corafon" by PPG or approved equal.
  - 2. Custom color and gloss as selected by the Commissioner.

**2.2 STAINLESS STEEL ELEMENTS**

- A. Provide stainless steel sheet conforming to ASTM A 240 or ASTM A 666, Type 304, Mo. 4 finish.
  - 1. Thickness: 0.025 inch, unless otherwise indicated.
- B. Provide UL-90 assembly rated fastener clips, of same material as copings.
- C. Provide concealed splice plates 12'-0" o.c. fabricated of 0.050" thick steel to match exposed steel; finished to match exposed steel.
- D. Provide pre-fabricated mitered and welded corner units.
- E. For copings, provide galvanized steel anchor plates, anchors spaced 6'-0" o.c. and snap-lock coping design; all anchors concealed.

**PART 3 EXECUTION**

**3.1 INSPECTION**

- A. Examine the areas and conditions where roof specialties and 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 INSTALLATION**

- A. General: Comply with manufacturer's instructions and recommendations. Coordinate with installation of roof deck and other substrates to receive accessory units, and with roof insulation, roofing and flashing; as required to ensure that each element of the work performs properly, and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.
- B. Isolation: Where metal surfaces of units are to be installed in contact with non-compatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation.
- C. Cap Flashing: Where cap flashing is required as component of accessory, install to provide adequate waterproof overlap with roofing or roof flashing (as counter flashing). Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.

### **3.3 BUILT-IN GUTTERS**

- A. Built-in gutter linings shall be formed in 8 ft. lengths except where the girth of the gutter lining exceeds 36" in which case transverse seams 36" o.c. shall be employed. All transverse seams shall be lapped 1-1/2", soldered and riveted. Rivets shall be 1/8" dia. spaced 2" o.c. The rear edge of the gutter lining shall terminate in a flange which extends a min. of 6" up the roof slope. The flange shall be cleated at 12" intervals. The front edge of the gutter lining shall be hooked into a continuous cleat formed by the fascia.
- B. Expansion joints of the standard bulkhead and cover plate type shall be installed in all gutter linings midway between drains. A minimum clearance of 1" shall be maintained between the bulkheads.

### **3.4 CLEANING AND PROTECTION**

- A. Clean exposed metal surfaces in accordance with manufacturer's instructions. Touch up damaged metal coatings.

**END OF SECTION**

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**SECTION 078413**

**FIRESTOPS AND SMOKESEALS**

**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. Penetrations through fire-resistance-rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
  - 2. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
  - 3. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.
  - 4. Sealant joints in fire-resistance-rated construction.
  - 5. Penetrations at each floor level in shafts and/or stairwells.
  - 6. Construction joints, including those between top of fire rated walls and underside of floors above.

**1.3 RELATED SECTIONS**

- A. Cast-in-place concrete - Section 033000.
- B. Joint sealers - Section 079200.
- C. Drywall - Section 092900.
- D. Piping penetrations - Division 22.
- E. Duct penetrations - Division 23.
- F. Cable and conduit penetrations - Division 26.

**1.4 REFERENCES**

- A. ASTM E 814 "Standard Method of Fire Tests of Through-Penetration Firestops."
- B. UL 1479, UBC 7-5 (Both are same as A. above).
- C. ASTM E 119 "Standard Method of Fire Tests of Building Construction and Materials."
- D. UL 263, UBC 7-1 (Both are same as C. above).
- E. UL 2079 "Tests For Fire Resistance of Building Joint Systems."
- F. ASTM E 1399 "Test For Dynamic Movement Conditions."
- G. ASTM E 1966 (Same as E. above).
- H. Published Through-Penetration Systems by recognized independent testing agencies.
  - 1. UL Fire Resistance Directory, Volume II of current year.
  - 2. Warnock Hersey Certification Listings, current year.
  - 3. Omega Point Laboratories, current year.

**1.5 SUBMITTALS**

- A. Submit manufacturer's product literature for each type of firestop material to be installed. Literature shall indicate product characteristics, typical uses, performance, limitation criteria, test data and indication that products comply with specified 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, for proposed UL listed (or equal) firestop and smoke seal assembly required for the Project.
- C. Material Safety Data Sheets: Submit MSDS for each firestop product.
- D. 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.



- E. Manufacturer's Letters: For installations or configurations not covered by a UL or Warnock Hersey design number, a recommendation shall be obtained from the manufacturer, in writing, for the specific application.

**1.6 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. Firestopping products shall be asbestos free and free of any PCBs.
- D. Do not use any product containing solvents or that requires hazardous waste disposal.
- E. Do not use firestop products which after curing, dissolve in water.
- F. Do not use firestop products that contain ceramic fibers.
- G. Firestopping Installer Qualifications: Firestop application shall be performed by a single firestopping contractor who specializes in the installation of firestop 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 installing firestop systems of the type herein specified.
- H. 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.
- I. 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.

**1.7 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.

**1.8 PROJECT CONDITIONS**

- A. Verify existing conditions and substrates before starting work
- B. Do not use materials that contain solvents, show sign of damage or are beyond their shelf life.
- C. During installation, provide masking and drop cloths as needed to prevent firestopping products from contaminating any adjacent surfaces.
- D. Conform to ventilation requirements if required by manufacturer's installation instructions or Material Safety Data Sheet.
- E. Weather Conditions: Do not proceed with installation of firestop products when temperatures are in excess or below the manufacturer's recommendations.
- F. Schedule installation of firestop products after completion of penetrating item installation but prior to covering or concealing of openings.
- G. Coordinate this work as required with work of other trades.

**1.9 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 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

### **2.2 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. 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.

- C. Applications: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.
- D. Smoke seals at top of partitions shall be flexible to allow for partition deflection.

## **2.3 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.

## **2.4 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.

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- 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.
- 2.5 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.
  - B. Material shall be classified non-combustible per ASTM E 119.
- 2.6 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 or not 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.

#### **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 to determine, in general, if it is being installed in compliance with requirements.
- 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.

**3.8 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.

**END OF SECTION**



**SECTION 079200**

**JOINT SEALERS**

**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 joint sealers work as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:
  - 1. Exterior wall joints not specified to be sealed in other Sections of work.
  - 2. Joints at wall penetrations.
  - 3. Joints between items of equipment and other construction.
  - 4. All other joints required to be sealed to provide a positive barrier against penetration of air and moisture.

**1.3 RELATED SECTIONS**

- A. Roofing - Division 7.

**1.4 QUALITY ASSURANCE**

- A. 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.
- B. Pre-Construction Field Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to project joint substrates according to the method in ASTM C 794 and C 1521 that is appropriate for the types of Project joints.
- C. Perform testing per ASTM C 1248 on sealants to determine if sealants or primers will stain adjacent surfaces. No sealant work shall start until results of these tests have been submitted to the Commissioner and he has given his written approval to proceed with the work.

**1.5 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, submit physical samples (not color chart).
  - 2. Sealant bond breaker and joint backing.
- C. Product Data: Submit manufacturer's technical information and installation instructions for:
  - 1. Sealant materials, indicating that material meets standards specified herein.
  - 2. Backing rods.
- D. Submit manufacturer's certification as required by Article 1.6 herein.
- E. Submit results of testing required in Article 1.4 herein.

**1.6 MANUFACTURER'S RESPONSIBILITY AND CERTIFICATION**

- A. Contractor shall require sealant manufacturer to review the Project joint conditions and details for this Section of the work. Contractor shall submit to the Commissioner written certification from the sealant manufacturer that joints are of the proper size and design, that the materials supplied are compatible with adjacent materials and backing, that the materials will properly perform to provide permanent watertight, airtight or vaportight seals (as applicable), and that materials supplied meet specified performance requirements.

**1.7 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.

**1.8 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.

C. Storage

1. Store sealant materials and equipment under conditions recommended by their manufacturer.
2. Do not use materials stored for a period of time exceeding the maximum recommended shelf life of the material.
3. Material shall be stored in unopened containers with manufacturers' name, batch number and date when shelf life expires.

#### 1.9 WARRANTY

A. Provide a written, notarized warranty from the manufacturer stating that the applied sealants shall show no material failure for a period of ten (10) years.

#### 1.10 GUARANTEE

- A. Contractor to provide a written, notarized, guarantee stating that the applied sealants shall show no failure due to improper installation for a period of two (2) years.
- B. Guarantee shall be in a form acceptable to the City of New York and executed by an authorized individual.
- C. Include in guarantee 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 SEALANT MATERIALS

A. Exterior Wall Sealant: Provide one (1) part non-sag sealant equal to No. 790 or 795 made by Dow Corning, "Silpruf SCS 2000" or "LM SCS 2700" made by G.E., "Spectrem 1" or "Spectrem 3" made by Tremco, "Sonolastic 150" by Sonneborn, or approved equal conforming to the minimum standards of ASTM C 920, Type S, Grade NS, Class 50.

1. Colors: Custom colors of sealants as selected by the Commissioner.

#### 2.2 MISCELLANEOUS MATERIALS

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing

- B. **Back-Up Materials:** Provide back-up materials and preformed joint fillers, non-staining, non-absorbent, compatible with sealant and primer, and of a resilient nature, twenty-five (25) percent wider than joint width unless otherwise recommended by manufacturer. Materials impregnated with oil, bitumen or similar materials shall not be used. Provide back-up materials only as recommended by sealant manufacturer in writing.
  - 1. **Cylindrical Sealant Backings:** ASTM C 1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance
- C. Provide bond breakers, where required, of polyethylene tape as recommended by manufacturer of sealant.
- D. Provide primers recommended by the sealant manufacturer for each material to receive sealant. Note that each exterior joint must be primed prior to sealing.
- E. Provide solvent, cleaning agents and other accessory materials as recommended by the sealant manufacturer.
- F. Materials shall be delivered to the job in sealed containers with manufacturer's original labels attached. Materials shall be used per manufacturer's printed instructions.

### **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 INSTALLATION**

- A. **Sealant Installation Standard:** Comply with instructions and recommendations of the manufacturer and in accordance with 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. **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. Commissioner 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 Commissioner.
  3. Accepted control section shall be standard to which all other sealant work must conform.
- C. Supervision: The Contractor shall submit to the Commissioner 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.
- D. 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.
- E. 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. Apply primer with clean brush and only when temperature is above 45 deg. F.
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 hand guns or pressure equipment, on clean, dry, properly prepared substrates, completely filling joints to eliminate air pockets and voids. Mask adjacent surfaces of joint with 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.
10. **Tooling:** Tool exposed joints to form smooth and uniform beds, with slightly concave surface conforming to joint configuration per Figure 4A 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.
11. Replace sealant which is damaged during construction process.

**END OF SECTION**

SECTION 079201

SEALANTS AND FILLER MATERIAL- DIESEL FUEL SYSTEM

PART 1 - GENERAL

1.01 SCOPE OF WORK

The Contractor shall furnish all labor, materials, tools and equipment, and perform all operations necessary to install all fillers, sealants and other sealing materials in the locations indicated by the Contract Drawings, as herein specified, or as directed by the Construction Manager.

1.02 GENERAL

All work shall be done in strict accordance with each manufacturer's instructions, and by a thoroughly experienced Contractor in this work. The Contractor shall be responsible for the examination and acceptance of all surfaces to receive fillers, and sealants and conditions affecting the proper installation of this material, and shall not proceed until all unsatisfactory conditions have been corrected.

1.03 APPLICABLE REFERENCES

The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation and shall be the latest published version.

A. American Society for Testing and Materials (ASTM)

ASTM D1752 Preformed sponge rubber and cork expansion joint fillers for concrete paving.

B. Federal Specifications (FS)

FS TT-S-00227 (Rev E; Am 3) Sealing Compound, Elastomeric Type, Multi Component for Caulking, Sealing, and Glazing (for Buildings and Other Structures)

1.04 SUBMITTALS

A. The Contractor shall submit samples of all sealant and filler materials for approval. Each "type" shall be accompanied by a Certificate stating that the compound has met the requirements herein specified.

B. Six (6) copies of the Manufacturer's Data Sheets, for each product; Six (6) Color Charts; and Six (6) Applied Samples of each product shall be submitted.

1.05 QUALITY ASSURANCE

Container Labels: Include manufacturer's name, trade name of product, kind of material, federal specification number (if applicable), expiration date (if applicable) and packaging date or batch number shall be submitted to the Construction Manager for approval by the Commissioner.

**1.06 PROJECT CONDITIONS**

**A. Environmental Requirements**

1. Temperature: Unless otherwise approved or recommended in writing by the sealant manufacturer, sealants shall not be installed at temperatures below 40 degrees F or above 85 degrees F.
2. Humidity and Moisture: Fillers and Sealants shall not be installed under conditions that are detrimental to the application, curing, and performance of the materials.

- B. Protection:** The Contractor shall protect all surfaces adjacent to sealants with non-staining removable tape or other approved covering to prevent soiling or staining.

**1.07 DELIVERY AND STORAGE**

Materials shall be delivered to the job in the manufacturer's original unopened containers. The containers shall include the following information on the label: manufacturer, name of material, formula or specification number, lot number, color, date of manufacture, mixing instructions, shelf life, and curing time, when applicable, at the standard conditions for laboratory tests. Caulking compound or components outdated as indicated by shelf life shall not be used. Materials shall be carefully handled and stored to prevent inclusion of foreign materials or exposure to temperatures exceeding 90 degrees F. Sealant tape shall be handled and stored in a manner that will not deform the tape.

**PART 2 - PRODUCTS**

**2.01 SEALANTS**

Sealant for use in horizontal expansion or control joints shall be compatible with petroleum products and shall conform to FS TT-S-00227.

**2.02 JOINT FILLER**

- A. Joint Backing:** Backup materials shall be nonabsorbent, nonstaining, compatible with the sealant used, compatible with petroleum products and shall be rolled into the joint cavity with approved tool.
- B. Compressible Fillers:** Compressible fillers shall be compatible with petroleum products and conform to ASTM D 1752. The filler shall be furnished 25 percent wider than the joint width unless otherwise indicated.

**2.03 MISCELLANEOUS MATERIALS**

- A. Joint Primer/Sealer/Conditioner:** Primers, Sealers and Conditioners shall be utilized and installed as recommended by the sealant manufacturer for the particular joint surface materials and conditions.



- B. Cleaning Solvents: Oil free solvents shall be utilized and installed as recommended by the sealant manufacturer. The Contractor shall not use re-claimed solvents.
- C. Masking Tape: Tape shall be removable paper or fiber tape, self-adhesive, non-staining.
- D. Backer Rod: Rods shall be compressible rod stock and shall be compatible with petroleum products.
- E. Bond Breaker Tape: Breaker tape shall be polyethylene or other plastic tape as recommended by the sealant manufacturer; non-bonding to sealant; petroleum compatible; self-adhesive where applicable.

### **PART 3 - EXECUTION**

#### **3.01 SEALANT FORMATION**

- A. Intended Application: Each container brought to the job site with a different sealant formulation shall be marked for the intended use. For each intended use, the color shall be one of the manufacturer's standard colors, as directed by the Construction Manager. The sealant performance shall conform to the requirements specified herein.
- B. Components of each formulate shall be used only with the formula. Intermixing of components of different formulas shall not be used to modify the formula.
- C. Mixing shall be in accordance with instructions provided by the manufacturer of the sealants. Mixing equipment shall be thoroughly cleaned before mixing each batch. For multi-component sealants, the entire portion of the accelerator or smaller unit shall be added to the entire portion of the accelerator of smaller unit shall be added to the entire portion of the compound or large unit. The container shall have sufficient space at the top to allow for addition of the accelerator and for mixing.

#### **3.02 EXAMINATION**

The Contractor shall examine all joint surfaces for conditions that may be detrimental to the performance of the completed Work. The Contractor shall not proceed until satisfactory corrections have been made.

#### **3.03 PREPARATION**

- A. The Contractor shall clean joint surfaces immediately before installation of sealant. The Contractor shall remove lacquers, protective coatings and similar materials from joint faces with manufacturer's recommended and approved solvents.
- B. The Contractor shall set joint fillers at proper depth and position as required for installation of bond breakers, backer rods, and sealants. The Contractor shall not leave voids or gaps between the ends of joint filler units.
  - 1. Smooth Edged Joints: For joints between two concrete slabs or where new concrete abuts smooth edged materials, the Contractor shall use either cork joint filler or closed cell polyurethane joint filler.

2. Irregular Edged Joints: For joints where new concrete abuts granite curbs or other irregular edges, the Contractor shall use closed cell polyurethane joint filler.

C. Priming Joint Surfaces:

1. The Contractor shall prime all joints, if so recommended by the manufacturer's printed instructions.
2. The Contractor shall not allow the primer/sealer to spill or migrate onto adjoining surfaces.

3.04 JOINT BACKING INSTALLATION

- A. The Contractor shall install bond breaker tape in relaxed condition as it comes off the roll. The Contractor shall not stretch the tape. The Contractor shall lap individual lengths.
- B. The Contractor shall install backer rods of sufficient size to fill the joint width at all points in a compressed state. The Contractor shall compress backer rod at the widest part of the joint by a minimum of 25 percent. The Contractor shall not cut or puncture the surface skin of the rod.

3.05 SEALANT INSTALLATION

- A. Except as shown or specified otherwise, the Contractor shall install sealants in accordance with the manufacturer's printed instructions.
- B. The Contractor shall install sealants with ratchet hand gun or other approved mechanical gun. Where gun application is impractical, apply sealant with knife.
- C. Finishing: The Contractor shall tool all vertical, non-sag sealants so as to compress the sealant, eliminating all air voids and providing a neat, smoothly finished joint. The Contractor shall provide slightly concave joint surface, unless otherwise indicated or recommended by the manufacturer. The Contractor shall use tool wetting agents as recommended by the sealant manufacturer.

3.06 CLEANING

- A. The Contractor shall immediately remove misapplied sealant and droppings from metal surfaces with solvents and wiping cloths. On other materials, the Contractor shall remove misapplied sealant and droppings by methods and materials recommended in writing by the manufacturer of the sealant material.
- B. After sealants are applied and before skin begins to form on sealant, the Contractor shall remove all masking and other protection and clean up any remaining defacement caused by the work.

END OF SECTION

**SECTION 081113**

**STEEL 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 SECTION INCLUDES**

- A. Work of this Section includes all labor, materials, equipment and services necessary to complete the steel doors and frames work as shown on the drawings and/or specified herein, including, but not limited to, the following:
  - 1. Interior and exterior hollow metal doors and frames for fire rated and unrated door openings.
  - 2. Preparation of metal doors and frames to receive finish hardware, including reinforcements, drilling and tapping necessary.
  - 3. Preparation of hollow metal doors to receive glazing where required.
  - 4. Steel louvers for hollow metal doors.
  - 5. Furnishing anchors for building into masonry and drywall.
  - 6. Factory prime painting of work of this Section.
  - 7. Exterior doors are to be shop painted with PPG, Coraflon ADS intermix, Yellow Satn Sheer AD3C1016N.

**1.3 RELATED SECTIONS**

- A. Unit Masonry - Section 042000.
- B. Finish hardware - Section 087100.
- C. Gypsum drywall - Section 092900.
- D. Painting - Section 099000.

**1.4 SUBMITTALS**

- A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, compliance with standards referenced herein, sound and fire-resistance ratings, and finishes for each type of door and frame specified.

- B. Shop Drawings: Show fabrication and installation of doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, reinforcement for surface applied hardware, dimensions of profiles and hardware preparation, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessories:
- C. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Drawings.
  - 1. Coordinate glazing frames and stops with glass and glazing requirements.
- D. Oversize Construction Certification: For door assemblies required to be fire rated and exceeding limitations of labeled assemblies, submit certification of a testing agency acceptable to authorities having jurisdiction that each door and frame assembly has been constructed to comply with design, materials, and construction equivalent to requirements for labeled construction.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing custom steel doors and frames similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.
- C. Source Limitations: Obtain custom steel doors and frames through one source from a single manufacturer.
- D. Fire-Rated Door and 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.
  - 1. Test Pressure: Test according to NFPA 252 or UL 10C. After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40" or less above the sill.
  - 2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to authorities having jurisdiction that doors comply with standard construction requirements for tested and labeled fire-protection-rated door assemblies except for size.
  - 3. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 250 deg. F. (or greater if required by Code) maximum in 30 minutes of fire exposure.

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- E. 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. Label each individual glazed lite.
- F. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.
- G. For projects located in New York City, fire rated assemblies must have M.E.A. approval with UL label.

### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver doors and frames palletted, wrapped, or crated to provide protection during transit and Project site storage. Do not use nonvented plastic.
- B. Inspect doors and frames, on delivery, for damage. Minor damage may be repaired provided refinished items match new work and are approved by Commissioner; otherwise, remove and replace damaged items as directed.
- C. Store doors and frames under cover at building site. Conform to the requirements of ANSI A 250-11-2001 for site storage unless more stringent requirements are noted herein. Place units on minimum 4-inch high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to permit air circulation.

## **PART 2 PRODUCTS**

### **2.1 FABRICATION - GENERAL**

- A. Fabricate hollow metal units to be rigid, neat in appearance and free from defects, warp or buckle. Accurately form metal to required sizes and profiles. Weld exposed joints continuously, grind, dress, and make smooth, flush and invisible. Metallic filler to conceal manufacturing defects is not acceptable.
- B. Unless otherwise indicated, provide countersunk flat Phillips or Jackson heads for exposed screws and bolts.
- C. Prepare hollow metal units to receive finish hardware, including cutouts, reinforcing, drilling and tapping in accordance with Finish Hardware Schedule and templates provided by hardware suppliers. Comply with applicable requirements of ANSI A115 "Specifications for Door and Frame Preparation for Hardware."
- D. Locate finish hardware as shown on final shop drawings in accordance with locations noted herein.

**2.2 MANUFACTURERS**

- A. Provide products manufactured by Steelcraft, Curries, Ceco Door Products, or approved equal meeting these specifications.

**2.3 FRAMES**

**A. Materials**

1. Frames for exterior openings shall be made of commercial grade cold-rolled steel conforming to ASTM A 1008/A, Type B not less than 14 ga., and shall have a hot dipped galvanized coating conforming to ASTM A 924 and A 653 with A-60 coating. The zinc-alloy coating shall be a dull matte surface treated for paint adhesion.
2. Frames for interior openings shall be either commercial grade cold-rolled steel conforming to ASTM A 1008/A, Type B or commercial grade hot-rolled steel conforming to ASTM A 1011/A, Commercial Steel, Type B. Metal thickness shall be not less than sixteen (16) ga. for frames in openings 4'-0" or less in width; not less than fourteen (14) ga. for frames in openings over 4'-0" in width.

**B. Design and Construction**

1. All frames shall be welded units with integral trim, of the sizes and shapes shown on approved shop drawings. Unless otherwise noted, knocked-down frames will only be accepted in drywall assemblies that have the drywall panels in place prior to installing the door frame.
  - a. Where knock-down frames are scheduled (at drywall), corners shall be mitered and reinforced with a wedge lock corner clip to provide a firm interlock of jambs to head.
2. All finished work shall be strong and rigid, neat in appearance, square, true and free of defects, warp or buckle. Molded members shall be clean cut, straight and of uniform profile throughout their lengths.
3. Jamb depths, trim, profile and backbends shall be as shown on drawings.
  - a. Frames at drywall partitions shall be formed with double return backbends to prevent cutting into drywall surface.
4. Welded frames shall have corners mitered and reinforced and faces of welded frames shall be continuously back welded full depth and width of frame conforming to NAAMM Standard HMMA-820; face joints shall be hairline.

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5. Minimum depth of stops shall be 5/8". Cut-off (Sanitary or hospital type) stops, where scheduled, shall be capped at forty-five (45) degrees at heights shown on drawings, and all jamb joints below cut-off stops shall be ground and filed smooth, making them imperceptible. Do not cut off stops on frames for soundproof, light proof or lead-lined doors.
6. Frames for multiple or special openings shall have mullion and/or rail members which are closed tubular shapes having no visible seams or joints. All joints between faces of abutting members shall be securely welded and finished smooth.
  - a. Mullions shall have 16 ga. internal steel stiffeners welded not less than 4" o.c.
7. Hardware Reinforcements
  - a. Frames shall be mortised, reinforced, drilled and tapped at the factory for fully-templated mortised hardware only, in accordance with approved hardware schedule and templates provided by the hardware supplier. Where surface-mounted hardware is to be applied, frames shall have reinforcing plates.
  - b. Minimum thickness of hardware reinforcing plates shall be as follows:
    - 1). Hinge and pivot reinforcements - seven (7) ga., 1-1/4" x 10" minimum size.
    - 2). Strike reinforcements - twelve (12) gauge
    - 3). Flush bolt reinforcements - twelve (12) gauge
    - 4). Closer reinforcements - twelve (12) gauge
    - 5). Reinforcements for surface mounted hardware - twelve (12) gauge.
8. Floor Anchors
  - a. Provide adjustable floor anchors, providing not less than two (2) inch height adjustment.
  - b. Minimum thickness of floor anchors shall be fourteen (14) gauge.
9. Jamb Anchors
  - a. Frames for installation in masonry walls shall be provided with adjustable jamb anchors of the wire type. Anchors shall be not less than 0.156" diameter steel wire. The number of anchors provided on each jamb shall be as follows:
    - 1). Frames up to 7'-6" height - three (3) anchors.
    - 2). Frames 7'-6" to 8'-0" height - four (4) anchors.
    - 3). Frames over 8'-0" height - one (1) anchor for each 2'-0" or fraction thereof in height.

- b. Frames for installation in stud partitions shall be provided with steel anchors of suitable design, not less than eighteen (18) gauge thickness, securely welded inside each jamb as follows:
    - 1). Frames up to 7'-6" height - four (4) anchors.
    - 2). Frames 7'-6" to 8'-0" height - five (5) anchors.
    - 3). Frames over 8'-0" height - five (5) anchors plus one additional for each 2'-0" or fraction thereof over 8'-0".
  - c. Knock-down frames for installation in stud partitions that have drywall panels in place prior to installation of door frames shall have compression anchors at each jamb placed 4" below head of frame and attached to steel stud, bottom of frame shall have 16 ga. adjustable steel clip anchors fastened to stud runner.
    - 1). Where height of frame is 9'-0" or greater, provide two (2) compression anchors at each jamb spaced 4" apart starting 4" below head of frame.
  - d. Frames to be anchored to previously placed concrete or masonry shall be provided with minimum 3/8" concealed bolts set into expansion shields or inserts at six (6) inches from top and bottom and twenty-four (24) inches o.c. Reinforce frames at anchor locations with sixteen (16) gauge sheet steel stiffeners welded to frame at each anchor.
- 10. Anchors in exterior frames and in masonry walls shall be hot dip galvanized per ASTM A 153.
  - 11. Frames for installation in masonry wall openings more than 4'-0" in width shall have an angle or channel stiffener factory welded into the head. Such stiffeners shall be not less than twelve (12) gauge steel and not longer than the opening width, and shall not be used as lintels or load bearing members.
  - 12. Dust cover boxes (or mortar guards) of not thinner than twenty-six (26) gauge steel shall be provided at all hardware mortises on frames to be set in masonry or plaster partitions.
  - 13. Ceiling Struts: Minimum 3/8" thick x 2" wide steel.
  - 14. All frames shall be provided with a steel spreader temporarily attached to the feet of both jambs to serve as a brace during shipping and handling.
  - 15. Loose glazing stops shall be of cold rolled steel, not less than twenty (20) gauge thickness, butted at corner joints and secured to the frame with countersunk cadmium-or zinc-plated screws. Interior frames may be provided with snap-on glazing stops.
  - 16. Except on weatherstripped frames, drill stops to receive three (3) silencers on strike jambs of single door frames and two (2) silencers on heads of double-door frames.



- C. Finish: After fabrication, all tool marks and surface imperfections shall be removed, and exposed faces of all welded joints shall be dressed smooth. Interior frames shall then be chemically treated to insure maximum paint adhesion and shall be coated on all surfaces with one coat of rust-inhibitive baked-on alkyd primer standard with the manufacturer which is fully cured before shipment to a dry film thickness of 2.0 mils.
1. Frames set in interior masonry walls shall be grouted in as described in Section 042000, "Unit Masonry." These frames shall have surfaces in contact with grout shop coated with epoxy coating equal to Series 27 FC Typoxy made by Tnemec or approved equal spray applied at 4 to 6 mils, passing NFPA 101, Class A for smoke and flame spread, tested per ASTM E 84.
  2. For shop painting of exterior frames, refer to description of Coraflon process in Door Finish article.

## 2.4 HOLLOW METAL DOORS

- A. Materials: Doors shall be made of commercial quality, level, cold rolled steel conforming to ASTM A 1008/A, Commercial Steel, Type B and free of scale, pitting or other surface defects. Face sheets for interior doors shall be not less than eighteen (18) gauge. Face sheets for exterior doors shall be not less than sixteen (16) gauge and shall have a hot dipped galvanized coating conforming to ASTM A 924 and A 653, A-60 coating. The zinc alloy coating shall be a dull matte surface treated for paint adhesion.
- B. Design and Construction
1. All doors shall be of the types and sizes shown on the approved shop drawings, and shall be fully welded seamless construction with no visible seams or joints on their faces or vertical edges. Minimum door thickness shall be 1-3/4".
  2. All doors shall be strong, rigid and neat in appearance, free from warpage or buckles. Corner bends shall be true and straight and of minimum radius for the gauge of metal used.
  3. Face sheets shall be stiffened by continuous vertical formed steel sections spanning the full thickness of the interior space between door faces. These stiffeners shall be not less than twenty two (22) gauge spaced not more than six (6) inches apart and securely attached to face sheets by spot welds not more than five (5) inches o.c. Spaces between stiffeners shall be sound deadened and thermal insulated the full height of the door with an inorganic non-combustible batt type material.
  4. Door faces shall be joined at their vertical edges by a continuous weld extending the full height of the door. All such welds shall be ground, filled and dressed smooth to make them invisible and provide a smooth flush surface.

5. Top and bottom edges of all doors shall be closed with a continuous recessed steel channel not less than fourteen (14) gauge, extending the full width of the door and spot welded to both faces. Exterior doors shall have an additional flush closing channel at their top edges and, where required for attachment of weatherstripping, a flush closure also at their bottom edges. Openings shall be provided in the bottom closure of exterior doors to permit the escape of entrapped moisture.
6. Edge profiles shall be provided on both vertical edges of doors as follows:
  - a. Single-acting swing doors - beveled 1/8" in two (2) inches.
  - b. Double acting swing doors - rounded on 2-1/8" radius.
  - c. No square edge doors permitted.
7. Hardware Reinforcements
  - a. Doors shall be mortised, reinforced, drilled and tapped at the factory for fully templated hardware only in accord with the approved hardware schedule and templates provided by the hardware supplier. Where surface-mounted hardware (or hardware, the interrelation of which is to be adjusted upon installation - such as top and bottom pivots, floor closers, etc.) is to be applied, doors shall have reinforcing plates.
  - b. Minimum gauges for hardware reinforcing plates shall be as follows:
    - 1). Hinge and pivot reinforcement - seven (7) gauge.
    - 2). Reinforcement for lock face, flush bolts, concealed holders, concealed or surface mounted closers - twelve (12) gauge.
    - 3). Reinforcements for all other surface mounted hardware - sixteen (16) gauge.
8. Glass Moldings and Stops
  - a. Where specified or scheduled, doors shall be provided with hollow metal moldings to secure glazing by others in accordance with glass opening sizes shown on drawings.
  - b. Fixed moldings shall be securely welded to the door on the security side.
  - c. Loose stops shall be not less than twenty (20) gauge steel, with mitered corner joints, secured to the framed opening by cadmium or zinc-coated countersunk screws spaced eight (8) inches o.c. Snap-on attachments will not be permitted. Stops shall be flush with face of door.
9. Louvers shall be sixteen (16) gauge sheet steel, stationary type, closely spaced inverted "V" blade design, flush with face sheets of door, integral with and welded to door. Fifty (50) percent free area, unless indicated otherwise on drawings.

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- C. Finish: After fabrication, all tool marks and surface imperfections shall be dressed, filled and sanded as required to make all faces and vertical edges smooth, level and free of all irregularities.
  - 1. Interior doors shall be chemically treated to insure maximum paint adhesion and shall be coated, on all exposed surfaces, with manufacturer's standard rust-inhibitive alkyd primer as specified for frames, which shall be fully cured before shipment.
  - 2. Coraflon Finish on Galvanized Steel Exterior Doors
    - a. Abrasive blast per SSPC SP-7/ NACE 4 "Brush-Off Blasting" removing a passivator that may be present and obtaining a surface profile of 1.0 to 2.0 mils. Insure that a passivator is not present.
    - b. Primer Application: Apply Coraflon™ ADS Wash Primer ADS225/ADS 226 @ 0.3-0.5 Mils dry film thickness (DFT). Allow the primer to cure a minimum of 2 hours prior to top coating.
    - c. Intermediate Application: Apply one coat of Coraflon™ ADS High Build Epoxy Primer/Intermediate ADS.
    - d. Full cure will be achieved in three to five days.
- D. Flatness: Doors shall maintain a flatness tolerance of 1/16" maximum, in any direction, including in a diagonal direction.

### 2.5 LABELED DOORS AND FRAMES

- A. Labeled doors and frames shall be provided for those openings requiring fire protection ratings as scheduled on drawings. Such doors and frames shall be labeled by Underwriters' Laboratories or other nationally recognized agency having a factory inspection service.
- B. If any door or frame specified by the Commissioner to be fire-rated cannot qualify for appropriate labeling because of its design, size, hardware or any other reason, the Commissioner shall be so advised before fabricating work on that item is started.

### 2.6 HARDWARE LOCATIONS

- A. The location of hardware on doors and frames shall be as noted in "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames" of the Door Hardware Institute unless otherwise required by prevailing Handicap Codes.

### 2.7 CLEARANCES

- A. Fabricate doors and frames to meet edge clearances as follows:
  - 1. Jambs and Head: 1/8" plus or minus 1/16".
  - 2. Meeting Edges, Pairs of Doors: 1/8" Plus or minus 1/16".

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3. Bottom: 3/4" if no threshold; 3/8" at threshold.

B. Fire rated doors shall have clearances as required by NFPA 80.

### **2.8 MANUFACTURING TOLERANCES**

A. Manufacturing tolerance shall be maintained within the limits given in HMMA 841 of ANSI/NAAMM, current edition.

### **2.9 PREPARATION FOR FINISH HARDWARE**

A. Prepare door and frames to receive hardware:

1. Hardware supplier shall furnish hollow metal manufacturer approved hardware schedule, hardware templates, and samples of physical hardware where necessary to insure correct fitting and installation.

2. Preparation includes sinkages and cut-outs for mortise and concealed hardware.

B. Provide reinforcements for both concealed and surface applied hardware:

1. Drill and tap mortise reinforcements at factory, using templates.

2. Install reinforcements with concealed connections designed to develop full strength of reinforcements.

### **2.10 REJECTION**

A. Hollow metal frames or doors which are defective, have hardware cutouts of improper size or location, or which prevent proper installation of doors, hardware or work of other trades, shall be removed and replaced with new at no cost.

## **PART 3 EXECUTION**

### **3.1 INSPECTION**

A. Examine the areas and conditions where steel doors and frames 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. Refer to Section 062000 for installation procedures for all work of this Section.

**END OF SECTION**

**SECTION 084313**

**ALUMINUM ASSEMBLIES**

**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 aluminum entrances as indicated on the drawings and/or specified herein including the following:
  - 1. Exterior entrance systems and door.
  - 2. Aluminum fixed windows.

**1.3 RELATED SECTIONS**

- A. Sealants - Section 079200.

**1.4 SUBMITTALS**

- A. Product Data: Submit manufacturer's printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each material used. Provide certifications that materials and systems comply with specified requirements.
- B. Shop Drawings: Provide large scale shop drawings for fabrication, installation and erection of all parts of work. Provide plans, elevations, and details of anchorages, connections and accessory items. Provide installation templates for work installed by others. Show interfaces and relationships to work of other trades.
- C. Field Measurements: Take necessary field measurements before preparation of shop drawings and fabrication. Do not delay progress of job. If field measurements are not possible prior to fabrication, allow for field cutting and fitting.
- D. Initial Selection Samples: Submit samples showing complete range of colors, textures, and finishes available for each material used.
- E. Verification Samples: Submit representative samples of each material that is to be exposed in completed work. Show full color ranges and finish variations expected. Provide samples having minimum size of 144 sq. in.

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- F. Prior to commencement of work, provide letter from the glass manufacturer approving clear structural sealant in between the two insulated glass panels.

### **1.5 QUALITY ASSURANCE**

- A. Source: For each material type required for work of this Section, provide primary materials which are products of one manufacturer. Provide secondary or accessory materials which are acceptable to manufacturers of primary materials.
- B. Installer: A firm with a minimum of three years experience in type of work required by this Section and which is acceptable to manufacturers of primary materials.
- C. Design Criteria: Drawings indicate sizes, member spacings, profiles, and dimensional requirements of work of this Section. Minor deviations will be accepted in order to utilize manufacturer's standard products when, in the Commissioner's sole judgment, such deviations do not materially detract from the design concept or intended performances.

### **1.6 TESTS AND PERFORMANCE REQUIREMENTS**

- A. Manufacturer's Standard Tests: Provide manufacturer's standard test data showing compliance with specified requirements.
- B. Testing and performance data applies to exterior assemblies.
- C. Test Sequence: Test sequence is optional, except that air infiltration tests shall precede water resistance tests.
- D. Air Infiltration Test: Test unit in accordance with ASTM E 283, as follows:
  - 1. Static Air Pressure Difference: 6.24 psf for fixed storefront units, and 1.567 psf for doors.
  - 2. Performance: Maximum air leakage shall not exceed the following:
    - a. Fixed Storefront Units: 0.06 cfm per sq. ft. of window area.
    - b. Door Units: 0.50 cfm per sq. ft. of single doors, 1.00 cfm per sq. ft. for doors hinged in pairs.
- E. Water Leakage Test: Test fixed framing system in accordance with ASTM E 331.
  - 1. Test Pressure: 6.24 psf.
  - 2. Performance: No leakage as defined in test method at specified test pressure.
- F. Uniform Load Deflection Test: Test units in accordance with ASTM E 330, at following static air pressure difference (Design Wind Pressure), or loads

prescribed by code for this project site, whichever is greater. Apply pressure first to exterior side (positive) and then interior side (negative).

1. Design Wind Pressure: 30 pounds per square foot minimum.
  2. Test Procedure: Procedure A as specified in ASTM E 330.
  3. Performance: Deflection in each member measured at locations of greatest deflection shall not exceed  $L/175$  at specified Design Wind Pressure.
- G. Uniform Load Structural Test: Test units in accordance with ASTM E 330 at following static air pressure difference. Apply high pressure load first on one side and then on other side. At conclusion of test there shall be no glass breakage, permanent damage to fasteners, hardware parts, support arms or activating mechanisms.
1. Static Air Pressure: Minimum 1.5 times the Design Wind Pressure.
  2. Permanent Deformation in Any Member: Not to exceed 0.2% of member span.
- H. Condensation Resistant Factor: Not less than 45 for fixed storefront units, and not less than 48 for doors; per AAMA 1502.7.
- I. Thermal Movement: Provide storefront systems that allow for expansion and contraction of members throughout an ambient temperature range of 120°F.
- J. Seismic Loads: Provide entrance and storefront systems, including anchorage, capable of withstanding the effects of earthquake motions calculated according to requirements of authorities having jurisdiction or ASCE 7, "Minimum Design Loads for Buildings and Other Structures", Section 9, "Earthquake Loads", whichever are more stringent.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Deliver materials and products in unopened, factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Store under cover and protect from weather damage.
  - B. Sequence deliveries to avoid delays, but minimize on-site storage.
- 1.8 WARRANTIES
- A. Provide written warranty, signed by manufacturer, agreeing to repair or replace work that exhibits defects in materials or workmanship. "Defects" is defined to include, but not limited to, leakage of water, abnormal aging or deterioration, abnormal deterioration or fading of finishes, and failure to perform as required. Include requirement for removal and replacement of covering and connected adjacent work.

1. Warranty Period: Three (3) years from date of Substantial Completion; except finish shall be warranted for a period of fifteen (15) years from date of Substantial Completion.

## **PART 2 PRODUCTS**

### **2.1 ACCEPTABLE MANUFACTURERS/PRODUCTS**

- A. Provide storefronts and entrance systems of one of the following manufacturers that meet or exceed requirements of these specifications:
  1. Kawneer Company, Inc.
  2. Wausau Metals Corporation.
  3. EFCO.
  4. Vistawall.
  5. or approved equal
- B. Products:
  1. Exterior frame for doors shall be equal 451T, manufactured by Kawneer Company, Inc.; or approved equal manufacturer listed above.
  2. Exterior fixed frame system shall be equal to PG 123 Isoweb, manufactured by Kawneer Company, Inc.; or approved equal manufacturer listed above.
  3. Doors shall be "Medium Stile 350" manufactured by the Kawneer Co. Inc. or approved equal manufacturer listed above.

### **2.2 MATERIALS AND ACCESSORIES**

- A. Aluminum Members: Provide 6063-T5 alloy and temper as recommended by manufacturer for strength, corrosion resistance, and application of required finish. Comply with ASTM B 221 for extrusions, and ASTM B 209 for sheet/plate. Provide 0.125 in. thick extrusions for door stiles and storefront framing. Provide 0.050 in. thick aluminum for glazing moldings.
  1. Structural aluminum shapes shall conform to ASTM B 308.
- B. Fasteners: Provide non-magnetic stainless steel fasteners, warranted by manufacturer to be non-corrosive and compatible with aluminum components.
- C. Concealed Flashing: Dead-soft stainless steel, 26 gage minimum, or extruded aluminum 0.062 in. minimum, of an alloy and type selected by manufacturer for compatibility with other components.



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- D. Brackets and Reinforcements: Non-magnetic stainless steel or hot-dip galvanized steel complying with ASTM A 386.
- E. Concrete/Masonry Inserts: Cast-iron, malleable iron, or hot-dip galvanized steel complying with ASTM A 386.
- F. Bituminous Coatings: Cold-applied asphalt mastic compounded for 30-mil thickness per coat.
- G. Compression Weatherstripping: Manufacturer's standard replaceable stripping of molded neoprene or PVC gaskets complying with ASTM D 2287.
- H. Sliding Weatherstripping: Manufacturer's standard replaceable stripping of wool, polypropylene, or nylon woven pile, with nylon fabric or aluminum strip backing.

### 2.3 HARDWARE

- A. Provide hardware units as indicated, scheduled, or required for operation of each door. Refer to Section 087100, Finish Hardware for hardware description.

### 2.4 SEALANTS (NON-STRUCTURAL)

- A. All joints, which are sealed with sealant as part of the fabrication or erection procedure, shall be sealed with an approved butyl (concealed) or low modulus silicone (exposed or concealed) sealant in color to match the adjoining surfaces or as may be required by the Commissioner. All perimeter sealant (metal to adjacent construction) shall be low or medium modulus silicone sealant. Silicone sealant shall be as manufactured by General Electric, Dow Corning, Pecora or approved equal. Butyl sealant shall be PTI 707 or approved equal.
- B. In using specified sealants, strictly observe the printed instructions of sealant manufacturer regarding joint size, limitations, backer rod, mixing, cleaning, surface preparation, priming and application. A primer shall be used, unless printed instructions advise to the contrary, and sealant manufacturer certifies that the use thereof will reduce its performance. Sealant shall not be applied when substrates are wet or when the temperature is below 40 deg. F.
- C. Care shall be exercised to insure against "Three Surface Adhesion." Bond breakers shall be provided where necessary.
- D. Contractor shall provide certification from sealant manufacturer that the sealant manufacturer has reviewed all sealant details and finds same suitable for the purpose intended, compatible with and will not stain the surfaces with which they are in contact. Statement as to compatibility, adhesion sufficiency and non-staining shall be accompanied by actual test results on production substrates performed in accordance with applicable ASTM procedures.

**2.5 SEALANTS (STRUCTURAL)**

- A. All components which are adhered with a structural silicone sealant/adhesive as part of the fabrication, glazing or erection procedure, shall be sealed/adhered with an approved structural silicone, as manufactured by General Electric, Dow Corning, Pecora or approved equal, and approved by the Commissioner. All glazing with structural silicone sealant/adhesive shall be accomplished in a shop wherever consistent with the design.
- B. In using specified sealants, strictly observe the printed instructions of sealant manufacturer regarding joint size, limitations, backer rod, mixing, cleaning, surface preparation, priming and application. A primer shall be used, unless printed instructions advise to the contrary. Sealant shall not be applied when substrates are wet or when the temperature is below 40 deg. F. Units shall not be moved until structural silicone seal has achieved full cure.
- C. Care shall be exercised to insure against "Three Surface Adhesion." Bond breakers shall be provided where necessary.
- D. Contractor shall provide certification from sealant manufacturer that the sealant manufacturer has reviewed all sealant details and tested all contact surfaces, and finds same suitable for use with proposed sealant, the purpose intended and compatible with the surfaces with which they are in contact. Sealant manufacturer's certification shall include the following based upon tests performed on production run materials:
  - 1. Test data of adhesion to production samples of metal and glass, tested in accordance with ASTM C 794.
  - 2. Compatibility statement that the materials in contact with the sealant such as gaskets, spacers, setting blocks, are compatible with the sealant after 21 days exposure to ultra violet, 2000 - 4000 (micro watt u.v. radiation).
  - 3. Stress statement that when exposed to the specified wind load the stress in the silicone sealant of dimensions shown does not exceed 20 psi with a safety factor of 6:1.
- E. Where silicone bonds to a metal or glass surface, the weakest element in the line of stress must have a minimum strength of 120 psi. For each combination of substrates submit report from an independent laboratory for tests performed in the following manner:
  - 1. Assemble and fully cure a minimum of 6 samples using actual substrates and a minimum sample length of 5".
  - 2. Subject sample to a tensile load such that nominal stress on silicone is 20 psi, hold for one minute and remove load. Repeat for additional loadings, increasing nominal silicone stress by 20 psi with each successive loading. Continue until failure occurs or until 200 psi is successfully applied.

3. All 6 samples must successfully withstand at least 120 psi. Report maximum stress and mode of failure. If one or more samples do not meet this criteria, revise failed element and repeat tests with 6 new samples. Repeat until all 6 samples are successfully tested.
4. Testing shall be performed in such a manner as to establish stress and safety factor over the temperature range described herein.
5. Prepare an outline for a quality assurance program for evaluation of adhesion and other physical attributes of sealants and submit to Commissioner for review and approval.
6. Program shall cover both initial testing of components for sealant adhesion/compatibility, etc., and also random testing of production run materials, etc. Include testing at full negative design pressure, one unit per one hundred units manufactured for the project. Also include methods which will be employed to monitor sealant application to insure full sealant contact. No sealant work shall be performed prior to approval of program.

## 2.6 FABRICATION

- A. Sizes and Profiles: Required sizes for door and frame units, including profile requirements, are indicated on Drawings. Any variable dimensions are indicated, together with maximum and minimum dimensions required to achieve design requirements and coordination with other work.
- B. Prefabrication: To greatest extent possible, complete fabrication, assembly, finishing, hardware application, and other work before shipment to project site. Disassemble components only as necessary for shipment and installation.
  1. Preglaze door and frame units to greatest extent possible, in coordination with installation and hardware requirements.
  2. Do not drill and tap for surface-mounted hardware items until time of installation at project site.
  3. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work in manner which prevents damage to exposed finish surfaces. For hardware, perform these operations prior to application of finishes.
- C. Welding: Comply with recommendations of American Welding Society to avoid discoloration; grind exposed welds smooth and restore mechanical finish.
- D. Reinforcing: Install reinforcing as necessary for performance requirements; separate dissimilar metals with bituminous paint or other separator to prevent corrosion.
- E. Continuity: Maintain accurate relation of planes and angles, with hairline fit of contacting members.

- F. Fasteners: Conceal fasteners.
- G. Provide EPDM/vinyl blade gasket weatherstripping in bottom exterior door rail, adjustable for contact with threshold.
- H. At interior doors and other locations without weatherstripping, provide neoprene silencers on stops to prevent metal-to-metal contact.
- I. Provisions shall be made in the framing for minimum edge clearance, nominal edge cover, and nominal pocket width for the thickness and type of glazing installed, and shall be in accordance with the FGMA Glazing Manual.
- J. Pocket glazed framing shall provide:

	<u>Single Glass</u>	<u>Ins. Glass</u>
1. Nominal edge cover (or bite) framing only	5/16"	1/2"
2. Min. nominal edge clearance	1/8"	1/4"
3. Min. face clearance	1/8"	5/32"

## 2.7 STOREFRONT FRAMING

- A. General: Provide inside-outside matched resilient flush glazed system with provisions for glass replacement. Shop fabricate and preassemble frame components where possible.
- B. Thermal-Break Construction: Fabricate exterior aluminum storefront framing system with integrally concealed, low conductance thermal barrier, located between exterior materials and exposed interior members, in manner which eliminates direct metal-to-metal contact. Provide manufacturer's standard construction which has been in use for similar projects for at least three years.

## 2.8 GLASS AND GLAZING

- A. Low Iron Insulating Glass: Insulated glass composition shall consist of 1/4" clear exterior lite of low iron tempered glass with Low E coating on No. 2 face, 1/2" air space and 1/4" clear interior low iron lite of float (or tempered, where required) glass. Provide factory assembled units of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space, complying with ASTM E 2190, and as follows:
  - 1. Sealing System: Dual Seal.
  - 2. Primary Sealant: Polyisobutylene.
  - 3. Secondary Sealant: Silicone, General Electric IGS 3204 or IGS 3100, Dow Corning 982 or approved equal.
    - a. For structurally glazed IG units, secondary seal shall conform to ASTM C 1249.

4. Primary and secondary seals shall not contain voids and must be continuously bonded to the glass structure.
5. Spacer: Clear finish aluminum with welded, soldered, or bent corners, hollow tube types, filled with low nitrogen absorption desiccant.
6. Desiccant: Molecular sieve, silica gel, or blend of both.
7. Air Space Thickness: 1/2".
8. Glass Thickness: 1/4" minimum.
9. Units shall be certified for compliance with seal classification "CBA" by the Insulating glass Certification Council (IGCC) or by IGMA and tested in accordance with the above ASTM Test Methods.
10. Insulated glass shall conform to the following tolerances:
  - a. Length and Width: + 3.0 mm/ -2.0 mm.
  - b. Diagonal: +/- 3.0 mm.
  - c. Thickness: As agreed +/- 1.0 mm.
  - d. Edge-Deletion of Coating: Minimum 8 mm wide. Width of deletion must be more than the width of the secondary seal. Silver layer(s) must be completely removed. Appearance must be uniform.
  - e. Primary PIB Seal: Must be complete with no breaks. Appearance must be uniform. PIB bead must overlap coating. No visible bright line when glass is viewed in transmission. The width of the PIB bead shall be 4.0 mm + 3.0/ - 1.5 mm.
  - f. Secondary Seal: Nominal 6 mm + 3.0/ - 1.5 mm. The minimum width of the secondary silicone seal for IG units that are glazed structurally must be determined according to ASTM C 1249. The secondary seal must be uniformly applied without bubbles, cavities or gaps. Avoid excess sealant that will need to be trimmed off later.
11. Additional requirements and properties for primary and secondary insulating glass seals and spacers:
  - a. Insulating glass unit hermetic seal to consist of butyl primary and silicone secondary seals with bent, welded, or soldered interpane spacer corners; keyed corners are not acceptable unless also soldered or welded. Spacers shall be aluminum or stainless steel. Locate spacer joint at the top or sides of the units, but in no instances at the sill. Design units to minimize the number of spacer joints. Provide solid keys, embedded in butyl sealant on all four sides, at spacer joints.
  - b. Hermetic seals must be continuous and intimately bonded to both lites of glass. Provide primary seal of uniform depth with a nominal width of 1/8 to 3/16 in. Hermetic seals shall not be contaminated with debris, fingerprints, or other foreign matter and shall not contain voids

or air pockets that decrease the width of the seal below the minimum widths listed in these Specifications, or that breach the seal. The width of the primary seal shall not be less than 1/16 in., and the total cumulative length of the primary seal between 1/16 in. and 1/8 in. shall be less than 12 in. in any one insulating glass unit. The primary seal shall not have a reduced thickness at the corners. An increased thickness of the primary seal at the corners is acceptable.

- c. Provide secondary seal of uniform depth with a nominal width of 1/4 in. Provide a total width of the primary and secondary seal of 1/2 in. Units shall carry CBA rating as established by ASTM E774 and shall meet SIGMA 65-7-2, latest edition. Units shall not contain breather or capillary tubes or similar penetrations.

## **2.9 ALUMINUM DOORS**

- A. Aluminum entrance doors shall be medium stile factory-glazed aluminum doors, manufactured by same manufacturer as storefront framing.
- B. Aluminum entrance doors shall be stile and rail type swing doors. Aluminum shall be extruded aluminum conforming to ASTM B 221, 0.125 in. thick for door stiles and 0.050 in. thick for glazing molding.
  - 1. Sections shall be of sizes and profiles indicated; shall present straight, sharply defined lines and arrises; and shall be free from defects impairing strength, durability, and appearance.
  - 2. Fasteners where exposed shall be aluminum stainless steel or plated steel conforming to ASTM A 164.
- C. Each door shall be factory glazed set in neoprene glazing gasket, see above for glass.
- D. Doors shall meet the following resistance to corner racking when tested by the Dual Moment Load Test.
  - 1. Test section shall consist of a standard top door corner assembly. Side rail section shall be 24" long and top rail section shall be 12" long.
  - 2. Anchor "top rail" positively to test bench so that corner protrudes 3" beyond bench edge.
  - 3. Anchor a lever arm positively to "side rail" at a point 19" from inside edge of "top rail". Attach weight support pad at a point 19" from inner edge of "side rail".
  - 4. Test section shall withstand a load of 235 lbs. On the lever arm before reaching the point of failure, which shall be considered a rotation of the lever arm in excess of 45 deg.

- E. Air Infiltration: (Applies only to single acting offset pivot or butt hung entrances).
  - 1. Air infiltration shall be tested in accordance with ASTM E 283, at a pressure differential of 1.567 psf. A single 3'-0" x 7'-0" entrance door and frame shall not exceed .50 cfm per linear foot of perimeter crack. A pair of 6'-0" x 7'-0" entrance doors and frame shall not exceed 1.0 cfm per linear foot of perimeter crack.
- F. For door hardware, refer to Section 087100.
- G. Door bottom rail of exterior doors shall have an EPDM blade gasket sweep strip applied with concealed fasteners.
- H. Corner construction shall consist of mechanical clip fastening, SIGMA deep penetration and fillet welds. Glazing stops shall be hook-in type with EPDM glazing gaskets.
- I. The door weatherstripping on a single acting offset pivot or butt hung exterior door and frame (single or pairs) shall be thermoplastic elastomer weathering on a tubular shape with a semi-rigid polymeric backing.
- J. The door weatherstripping on a double acting, center pivoted door and frame (single or pairs) shall be pile cloth. The door bottom rail shall be weathered with an EPDM blade gasket sweep strip applied with concealed fasteners.
- K. The meeting stiles on pairs of doors shall be equipped with an adjustable astragal.
- L. Shop paint as specified below.

**2.10 FINISH**

- A. High-Performance Organic 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 Three-Coat System: Manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605-98 equal to "Corafon" by PPG or approved equal.
  - 2. Custom color and glass as selected by the Commissioner.

## **PART 3 EXECUTION**

### **3.1 INSPECTION**

- A. Examine the areas and conditions where aluminum entrances and storefronts 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 aluminum entrance doors and storefront framing in openings prepared under other Sections plumb, square, level, in exact alignment with surrounding work, with proper clearances, and securely and positively anchored to building structure, to meet performance requirements specified herein, in accordance with manufacturer's published instructions and approved submittals.
- B. Use only skilled mechanics for erection, under supervision of manufacturer's representative.
- C. Provide protection against galvanic action. Isolate dissimilar materials with bituminous coating or non-absorptive dielectric tape.
- D. Install aluminum entrance doors, storefront frame, and finish hardware. Carefully fit and adjust doors and hardware to frames and weatherstripping. After erection check and adjust operating hardware for smooth and proper operation.
- E. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction, unless otherwise indicated. Comply with requirements of Section 079200.
- F. Erection Tolerances: Install entrance and storefront systems to comply with the following maximum tolerances.
  - 1. Variation from Plane: Limit variation from plane or location shown to 1/8" in 12'; 1/4" over total length.
  - 2. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16". Where surfaces meet at corners, limit offset from true alignment to 1/32".
  - 3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8".

### **3.3 PROTECTION AND CLEANING OF ALUMINUM**

- A. Protect finished metal surfaces from damage during fabrication, shipping, storage, and erection, and from then until acceptance by City of New York.



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- B. Clean metal surfaces promptly after installation, exercising care to avoid damage. Remove excess sealant, dirt, and other substances. Lubricate hardware and other moving parts.

### **3.4 PROTECTION AND CLEANING OF GLASS**

- A. Replace glass that is broken, cracked or chipped prior to time of final acceptance of Project by City of New York.
- B. Clean glass surfaces promptly after installation, exercising care to avoid damage to same.

**END OF SECTION**

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**SECTION 086200**

**PLASTIC UNIT SKYLIGHTS**

**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 plastic unit skylights as shown on the drawings and/or specified herein.

**1.3 RELATED SECTIONS**

- A. Existing roof repair - Section 075000.

**1.4 SUBMITTALS**

- A. Product data for each type of skylight specified, including details of construction relative to materials, dimensions of individual components, profiles, finishes, and glazing light transmission and thermal characteristics.
- B. Shop drawings showing fabrication and installation of skylights, including plans, elevations, sections, details of components, and attachments to other unit of Work. Show methods of connection and structural support for multiple units clustered together.

**1.5 QUALITY ASSURANCE**

- A. Contractors Qualifications
  - 1. The contractor or subcontractor performing the work of this section must, within the last five (5) consecutive years prior to the bid opening, have successfully completed in a timely fashion at least three (3) projects similar in scope and type to the required work.
  - 2. Installer shall be a Manufacturer approved/certified contractor experienced with the specified system and shall provide written certification from the manufacturer of the system certifying that installer is approved by manufacturer for installation of the specified system.
- B. Fire-Test Response Characteristics: Provide plastic sheets identical to those tested for the following fire-test-response characteristics, per ASTM test method indicated below, by UL or other testing and inspecting agencies acceptable to authorities having jurisdiction. Identify plastic sheets with appropriate markings of applicable testing and inspecting organization.

1. Self-Ignition Temperature: 650 deg. F. or greater when tested per ASTM D 1929 on plastic sheets in the thickness intended for use.
  2. Smoke density of 75 or less when tested per ASTM D 2843 on plastic sheets in the thickness intended for use.
  3. Relative-Burning Characteristics: Burning rate of 2.5 inches per minute or less when tested per ASTM D 635 on plastic glazing with a nominal thickness of 0.060 inch or the thickness intended for use.
- C. Structural Capacity: Up to 40 PSF positive and 40 PSF negative per ASTM E 283.
- D. Air Leakage: 0.05 @ 1.57 PSF per ASTM E 283.
- E. Water Resistance: No leakage @ 10 PSF per ASTM E 331.
- F. Windborne-Debris-Impact Resistance: Provide unit skylights that pass basic-protection testing requirements in ASTM E 1996 for wind zone indicated when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than unit skylights indicated for use on Project and shall be installed in same manner as unit skylights indicated for use on Project.
1. Large-Missile Test: For unit skylights located within 30 feet of grade.
  2. Small-Missile Test: For unit skylights located more than 30 feet above grade.

#### 1.6 WARRANTY

- A. Skylight Warranty: Provide written warranty signed by manufacturer, agreeing to repair or replace work that exhibits defects in materials or workmanship and guaranteeing weathertight and leak-free performance. "Defects" are defined as uncontrolled leakage of water and abnormal aging or deterioration.
1. Warranty Period: 5 years from date of Substantial Completion.
- B. Plastic Warranty: Provide written warranty signed by manufacturer agreeing to repair or replace work that has or develops defects in the plastic. "Defects" are defined as abnormal aging or deterioration.
1. Warranty Period for Plastic Glazing: 5 years from date of Substantial Completion against yellowing.
- C. Finish Warranty: Provide written warranty signed by manufacturer agreeing to repair or replace work with finish defects. "Defects" are defined as peeling, chipping, chalking, fading, abnormal aging or deterioration, and failure to perform as required.
1. Warranty Period for Fluoropolymer Finish: 5 years from date of Substantial Completion for color and film integrity.

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, provide skylights manufactured by Acralight International, Bristolite Skylights, Wasco Products, Inc., or approved equal.

### **2.2 MATERIALS**

- A. Aluminum Sheets: ASTM B 209 for Alclad alloy 3005-H25 or alloy and temper required to suit forming operations and finish requirements. Mill finish unless indicated otherwise.
- B. Extruded Aluminum: ASTM B 221 alloy 6063-T52 or alloy and temper required to suit structural and finish requirements. Mill finish unless indicated otherwise.
- C. Plastic Sheets: Monolithic, formable, transparent (colorless and tinted) or translucent (white) sheets with good weather and impact resistance. Provide one of the following, as indicated:
  - 1. Acrylic: ASTM D 4802, thermoformable, cast or continuous-cast acrylic (methacrylate), Category C-1 or C-2, Type UVA (formulated with ultraviolet absorber), with Finish 1 (smooth or polished), unless otherwise indicated.
  - 2. Polycarbonate Glazing: Thermoformable, extruded monolithic sheets, UV resistant, burglar-resistance rated according to UL 972, and with average impact strength of 12 to 16 ft-lb/in. of width when tested according to ASTM D 256, Test Method A (Izod).
- D. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other non-corrosive metal as recommended by manufacturer. Match finish of exposed fasteners with finish of material being fastened.
- E. Mastic Sealant: Polyisobutylene; non-hardening, non-skinning, non-drying, non-migrating sealant.
- F. Elastomeric Sealant: Generic type recommended by unit manufacturer that is compatible with joint surfaces. ASTM C 920; Type S; Grade NS; Class 25; and Uses NT, G, A, and (as applicable to joint substrates indicated) O.
- G. Protective Screens: Manufacturer's standard to protect against falling and windborne debris.
- H. Dropout-Type Heat and Smoke Vents: Manufacturer's standard, gravity operated and automatic, for integration within skylight assembly; with heat-sensitive glazing that will deform and drop out of vent opening according to heat and smoke vent standard indicated. Provide units that have been tested and listed to comply with UL 793, and are FM approved.

**2.3 FINISH FOR ALUMINUM**

- A. Fluoropolymer, Two-Coat Coating System: Manufacturer's standard two-coat thermocured system, complying with AAMA 605.2, composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene resin by weight; complying with AAMA 605.2.
  - 1. Color and Gloss: As selected by the Commissioner from manufacturer's standard choices for color and gloss.

**2.4 FABRICATION**

- A. General: Factory-assembled unit consisting of plastic glazing, extruded aluminum glazing retainer, gasketing, inner frame designed to mount on separate curb, and self-contained flashing.
- B. Curb: Existing to remain.
- C. Condensation Control: Fabricate skylight units with integral internal gutters and non-clogging weeps to collect and dispose of condensation.
- D. Thermal Break: Fabricate skylight units with thermal barrier separating interior metal framing from materials exposed to outside temperature.
- E. Glazing: Sloped pyramid, double-glazing profile fabricated from manufacturer's standard clear acrylic or impact-resistant polycarbonate, as indicated.
- F. Glazing Gaskets: Manufacturer's standard glazing system of EPDM or neoprene, closed-cell sponge neoprene, or EPDM, or of partially vulcanized butyl tape or liquid-applied elastomeric sealant.

**PART 3 EXECUTION**

**3.1 INSPECTION**

- A. Examine the areas and conditions where plastic unit skylights are to be installed and notify the Commissioner of 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. General: Conform with manufacturer's instructions and recommendations. Coordinate with installation of roof deck and other substrates to receive skylight units. Coordinate with installation of vapor barriers, roof insulation, roofing, and flashing as required to assure that each element of the work performs properly and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.
  - 1. Except as otherwise indicated, install roof skylights according to construction details of "NRCA Roofing and Waterproofing Manual."

- B. Isolation: Where metal surfaces of units are to be installed in contact with incompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide another permanent separation.
- C. Flange Seals: Except as otherwise indicated, set flanges of accessory units in a thick bed of roofing cement to form a seal.
- D. Cap Flashing: Where cap flashing is required as component of the skylight, install to provide an adequate waterproof overlap with roofing or roof flashing (as counterflashing). Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.

**3.3 CLEANING AND PROTECTION**

- A. Clean exposed metal and plastic surfaces according to manufacturer's instructions. Touch up damaged metal coatings.
- B. Clean and polish plastic skylight units, inside and out, not more than 5 days prior to date of substantial completion.

**END OF SECTION**

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**SECTION 087100**

**FINISH HARDWARE**

**PART 1 GENERAL**

**1.1 GENERAL REQUIREMENTS**

- A. Work of this Section, as shown or specified, shall be in accordance with the Contract Documents.

**1.2 SECTION INCLUDES**

- A. Work of this Section includes all labor, materials, equipment and services necessary to furnish all the finish hardware as shown on the drawings and/or specified herein.

**1.3 RELATED SECTIONS**

- A. Installation of finish hardware - Section 062000.
- B. Steel doors and frames - Section 081113.
- C. Entrance assemblies - Section 084313.
- D. Painting - Section 099000.

**1.4 QUALITY ASSURANCE**

- A. Hardware shall be suitable and adapted for its required use and shall fit its designated location. Should any hardware as shown, specified or required fail to meet the intended requirements or require modification to suit or fit the designated location, determine the correction or modification necessary and notify the Architect in ample time to avoid delay in the manufacture and delivery of hardware.
- B. For fire rated openings provide hardware complying with NFPA Standard No. 80. requirements of authorities having jurisdiction.
- C. Barrier Free Requirements: Maximum pressure applied to the latch area to open exterior doors shall not exceed fifteen (15) pounds. Interior doors which have a self-closing feature shall require pressure not to exceed five (5) pounds.

**1.5 SUBMITTALS**

- A. Before any finish hardware is ordered or purchased, submit catalog cuts and a complete Hardware Schedule of Finish Hardware. Each item listed in the Hardware Schedule shall be identifiable with respect to manufacture, brand, catalog number, material, and finish.
- B. Where submission differs from Schedule given herein, use different color or other means of identification to bring change to the attention of the Architect.

- C. Samples: Submit samples as requested by Architect. Do not proceed with installation until samples have been approved. Approved samples may be installed in the work after substantial completion of work. Samples shall include one (1) each of the following samples:

1. Hinge (each type)
2. Intermediate Pivot
3. Surface Closer
4. Lockset (office function)

#### 1.6 PRODUCT HANDLING

- A. Pack finish hardware in approved manufacturer's containers, complete with trimmings, bolts, screws, washers, etc., as required for application and securement. Each container shall bear a suitable label which shall state the quantity and kind of contents of said container, as well as identifying marks relating to the approved Hardware Schedule and its location in the project.
- B. Knobs, handles, pulls and other items of finish hardware with easily damaged finishes shall be individually wrapped before placing in containers and with sufficient sheet cloth or cotton-backed paper which shall be adequately tied with heavy strings; all as necessary to protect the finishes.
- C. Finish hardware shall be delivered, as directed, to the building site or the factories of the various fabricators of metal work to which such hardware is to be applied. Deliver hardware in the order required and in ample time to permit application at the building, or fabricators' shops, within the time required for the completion of the building.

#### 1.7 JOB CONDITIONS

- A. Field Service: The hardware supplier shall assign a competent representative, acceptable to the Architect, to be at the jobsite each time a major shipment of finish hardware is received. Such representative shall assist in "checking in" these shipments and shall secure a receipt covering the contents of each shipment. In addition, such representative shall be available for immediate call to the jobsite when, in the opinion of the Architect, his presence is necessary.
- B. Templates: Promptly following approval of the Hardware Schedule by the Architect, furnish and deliver template information, to the fabricators, of items to which finish hardware is to be applied.
1. Such deliveries shall be made in ample time to avoid delays in such work of said fabricators. Provide drawings, schedules and detailed information to other trades as necessary for them to accommodate and prepare their work to receive the finish hardware.

**C. Cooperation and Coordination**

1. Cooperate and coordinate work with that of other trades supplying materials or performing work in contact with, connecting to, underlying, or overlaying the work of this Section.
2. Provide complete data of requirements for work of this Section to those other trades whose work is affected by or dependent upon the work of this Section.
3. Furnish all items to be built into other work in ample time to avoid delaying the progress of such work.
4. Examine all drawings covering the work of this Section and refer to all other drawings, including mechanical and electrical drawings, which may affect the work of this Section or require coordination by this trade.

**PART 2 PRODUCTS**

**2.1 GENERAL**

- A. Requirements for design, grade, function, finish, size and other distinctive qualities of each type of finish hardware are indicated herein. Products are identified by using appropriate hardware designation numbers.
- B. Manufacturers are listed for each hardware type required. Provide either the product designated, or approved equal.
- C. Proprietary Products: References to specific proprietary products are used to establish minimum standards of utility and quality. Other materials may be considered by the Architect in accordance with the provisions of these specifications.
- D. Notwithstanding anything to the contrary in this specification or the drawings, the finish hardware shall conform to the requirements of governmental authorities having jurisdiction and such requirements shall be followed as if specifically set forth in this specification.
- E. Finish hardware shall conform to the applicable requirements of the American Insurance Association, and the National Board of Fire Underwriters' Laboratories, Inc., and other local authorities having jurisdiction, and each such item shall bear a label or mark of the Underwriters' Laboratories, Inc., indicating its conformity with such requirements for use in connection with its specified location.
- F. Finish hardware shall be uniform in color and finish and free from imperfections affecting its appearance, function, operation and serviceability. Such hardware shall be suited and adapted to its required use and shall fit its respective location.
- G. Where the finished shape or size of members receiving finish hardware are such as to prevent or render unsuitable the use of the specific types or sizes of such hardware, suitable types or sizes shall be furnished, having as nearly as practicable the same function, operation and quality as the specified hardware.

- H. Bolts, screws and other fastenings required for the application of the finished hardware shall be of size and type to fit requirements and shall be of the same material and finish as the exposed parts of such hardware which they adjoin. Exposed screws and bolts shall have countersunk oval heads and bolts shall be provided with cap nuts. Countersunk part of screw and bolt holes shall be finished smoothly without sharp edges and form a firm seal for such screw and bolt heads. Full threaded wood screws shall be furnished for all wood applications. No thru bolts will be allowed.

## 2.2 PRODUCTS AND MANUFACTURERS

- A. As per schedule

## 2.3 SPECIFIC ITEMS

### A. Hinges

1. Minimum of three 3 hinges per door leaf up to 7'-6" high. Provide one additional hinge per 2'-6" or fraction thereof.
2. Hinges shall be of types, sizes and materials as required to suit door weights thicknesses and fire ratings.
3. Hinge sizes shall be detailed so that the least amount of projection shall be visible from the frame.
4. Unless otherwise specified hinges shall have concealed ball-bearings (combination anti-friction or oil impregnated) and three (3) knuckles.
  - a. Standard doors shall have non-rising pins.
  - b. Doors exposed to the public, and other secure areas, as determined by the Owner, shall have non-removable pins.
5. Electric Hinges: Coordinate voltage and other electrical requirements with applicable portions of Division 26 "Electrical".

### B. Pivots

1. Provide quantities and types of pivots (offset, intermediate and center) as required to suit door sizes and weights.
2. Pivot sets (offset and center) shall consist of top and bottom pivots, unless otherwise indicated.
3. Provide a top pivot for each floor closer unless otherwise indicated.

### C. Closers

1. Unless otherwise indicated, closers shall not be visible on the public side of doors. Closers opening into public spaces shall be provided with parallel arms and brackets to suit.

2. Closers shall be sized in accordance with the accepted manufacturer's standards to suit height, width, weight of door and draft conditions.
  3. Provide a top pivot for each floor closer.
  4. Provide weather sealing compound for each exterior floor closer.
- D. Locking and Latching Devices
1. Mechanical: Provide types, functions, as specified. Coordinate with Owners keying requirements.
- E. Keys and Keying
1. Coordinate new keying requirements with requirements of building standard keying system.
  2. Provide three 3 keys for each differently keyed lock. Unless otherwise indicated, locks shall be keyed differently.
    - a. Locks to the following spaces shall be keyed alike:
      - 1). Mechanical Equipment Rooms, Electrical Panel Rooms, and Telephone Equipment Rooms.
      - 2). Janitor's Closets.
  3. Provide three 3 Master Keys.
  4. Final keying requirements will be determined by the Owner.
- F. Pushes and Pulls: Provide concealed fasteners where practical. Where exposed fasteners are required provide flush type finished to match push or pull.
- G. Flush Bolts: Provide top and bottom extension type flush bolts, mounted twelve (12) inches and seventy-two (72) inches respectively from the bottom of each door, where scheduled. Provide each bottom flush bolt with a dustproof strike.
- H. Silencers: Provide silencers for all non-gasketed and non-weatherstripped frames. Provide three (3) for each single swing door and two (2) for each pair of doors.
- 2.4 FINISHES
- A. Provide finish hardware with the following finishes unless otherwise shown:
1. Hinges: US32D.
  2. Pivots: US32D.
  3. Surface Closers: US32D.
  4. Locksets and Exit Devices: US32D.
  5. Pushes, Pulls, Kick Plates: US32D.

6. Flush Bolts: US32D.

### **PART 3 EXECUTION**

#### **3.1 GENERAL**

- A. Make periodic checks during construction in order to ascertain that the finish hardware furnished has been installed correctly. After completion of all construction work, adjust finish hardware to work properly; test all keys and adjust as required for smooth, free operation.

#### **3.2 HARDWARE SETS**

- A. See schedules.

**END OF SECTION**

**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.

**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. Sealant for gypsum drywall work.
  - 4. Concealed metal reinforcing for attachment of railings, toilet partitions and other items supported on drywall partitions and walls.
  - 5. Taping and finishing of drywall joints.
  - 6. Installing rings and frames in drywall surfaces for grilles, registers and lighting fixtures.
  - 7. Bracing and connections.

**1.3 RELATED SECTIONS**

- A. Thermal insulation - Section 072100.
- B. Hollow metal door frames - Section 081113.
- C. Painting - Section 099000.
- D. Rings for grilles, registers and light fixtures - Division 23 and 26.

**1.4 QUALITY ASSURANCE**

- A. 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.

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2. Construction Guide, latest edition, National Gypsum.
  3. ASTM A 568 "Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements For"
  4. ASTM C 475 "Standard Specification for Joint Treatment Materials For Gypsum Wallboard Construction"
  5. ASTM C 645 "Standard Specification for Non-Structural Steel Framing Members"
  6. ASTM C 754 "Standard Specification for Installation of Steel Framing Members to Receive Screw Attached Gypsum Panel Products"
  7. ASTM C 840 "Standard Specification for Application and Finishing of Gypsum Board"
  8. ASTM C 919 "Standard Specification for Use of Sealants in Acoustical Applications"
  9. 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"
  10. ASTM C 1002 "Standard Specification for Steel Self-Piercing Tapping Screws For the Application of Gypsum Board"
  11. ASTM C 1177 "Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing"
  12. ASTM C 1178 "Standard Specification for Glass Mat Water Resistant Gypsum Backing Board"
  13. ASTM C 1278 "Standard Specification for Fiber-Reinforced Gypsum Panel"
  14. ASTM C 1396 "Standard Specification for Gypsum Board"
  15. ASTM D 3273 "Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber"
- B. Allowable Tolerances: 1/32" offsets between planes of board faces, and 1/16" in 8'-0" for plumb, level, warp and bow.
- C. System Design Load
1. Provide standard drywall wall assemblies designed and tested by manufacturer to withstand a lateral load of 5 lbs. per sq. ft. for the maximum wall height required, and with deflection limited to L/240 of partition height.



- a. Drywall assemblies with tile finish shall have a deflection limit of  $L/360$ .
- 2. Provide drywall ceiling assemblies designed, fabricated and installed to have a deflection not to exceed  $L/360$ .
- 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 3 years of successful experience in the installation of specified materials.
- F. For projects located in New York City, 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 gypsum drywall construction.

#### 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.
- B. Samples: Each material specified herein, 12" x 12", or 12" long, or in manufacturer's container, as applicable for type of material submitted.
- C. 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 resistant joint compound.
- D. 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.

#### 1.7 ENVIRONMENTAL CONDITIONS

- A. Provide and maintain minimum temperature of fifty-five (55) degrees F. and adequate ventilation to eliminate excessive moisture within the building in the area of the drywall work for at least twenty-four (24) hours, prior to, during and after installation of drywall work. Installation shall not start until windows are glazed and doors are installed, unless openings are temporarily closed. Space above suspended ceilings shall be vented sufficiently to prevent temperature and pressure build up.

#### 1.8 JOB MOCK-UP

- A. At a suitable location, where directed by the Commissioner, 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 Commissioner to show stud spacing and attachments; after acceptance, complete assembly.
- B. Adjust the finishing techniques as required to achieve the finish required by the Commissioner as described in this Section of these specifications.
- C. Upon approval of the mock-up, the mock-up may be left in place as a portion of the finished work of this Section.
- D. 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: U.S. Gypsum Co., Georgia Pacific, Lafarge North America, National Gypsum Co. or approved equal meeting specification requirements are acceptable.
- B. Acceptable Manufacturers for Metal Supports of Drywall Assemblies: Unless otherwise noted, provide products manufactured by Dietrich Metal Framing, Super Stud Building Products, Marino/Ware, Clark Western or 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, 25 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 equal made by Metal-Lite Inc. or approved equal.
    - b. FireTrak (including stud clips) by FireTrak Corp. or equal made by Metal-Lite Inc. or approved equal.
- 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, 25 U.S. Std. gauge.
  3. 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.
- C. Suspended Ceiling and Fascia Supports**
1. Main Runners: 1-1/2" steel channels, cold rolled at 0.475 lbs. per ft., rust-inhibitive paint finish.
  2. Furring Members: Screw-type hat-shaped furring channels of 25 ga. zinc-coated steel; comply with ASTM C 645.
  3. Hangers: Galvanized, 1" x 3/16" flat steel slats capable of supporting 5x calculated load supported.
  4. Hanger Anchorages: Provide inserts, clips, bolts, screws and other devices applicable to the required method of structural anchorage for ceiling hangers. Size devices for 5x calculated load supported.
  5. Furring Anchorages: 16 ga. galvanized wire ties, manufacturer's standard clips, bolts or screws as recommended by furring manufacturer.
- D. All galvanized steel members shall have coating conforming to ASTM A 653, G60.**

### 2.3 GYPSUM WALLBOARD TYPES

- A. Gypsum Wall Board: 1/2" thick and 5/8" thick as indicated on drawings, "Sheetrock" by USG, "Gold Bond" by National Gypsum or approved equal, 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" by USG, "Firecheck Type C" by Lafarge, "Gold Bond Fireshield" by National Gypsum or approved equal, 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" by USG, "Dens-Shield Tile Backer Board" by Georgia Pacific, "Perma Base Brand Cement Board" by National Gypsum or approved equal. Cover joints with a pressure sensitive woven glass fiber tape equal to Imperial Type P Tape.
- D. Moisture/Mold 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," "Mold Tough FR," by U.S. Gypsum, "DensArmor Plus" by Georgia Pacific, Lafarge "Mold Defense" and/or Lafarge "Mold Defense Type X," "Gold Bond XP Gypsum Board" by National Gypsum or approved equal, 48" wide, in maximum lengths available to minimize end-to-end butt joints.
  - 1. Board must have a rating of 10 per ASTM D 3273 with a core that meets ASTM C 1396, Section 6 or ASTM C 1658.
- E. Exterior Gypsum Wall Board for Soffits: 5/8" thick "USG Exterior Gypsum Ceiling Board," Lafarge "Soffitboard," "Gold Bond Brand Exterior Soffit Board" by National Gypsum or approved equal conforming to ASTM C 1396, Section 8, and ASTM C 931.
- F. Mold Resistant Paperless Wall Board (at all perimeter walls and wet shafts): 1/2" and 5/8" thick as indicated on drawings, 48" wide "DensArmour Plus" by Georgia Pacific, "Gold Bond Brand EXP Interior Extreme" by National Gypsum, or approved equal that has a rating of 10 per ASTM D 3273 with core that meets ASTM C 1396, Section 6 or ASTM C 1658.
- G. Abuse Resistant Wallboard: 5/8" thick as indicated on drawings, "Fiberock Brand Panel VHI Abuse Resistant" by USG, "Dens Armor Plus Abuse Resistant Panels" by Georgia Pacific, Lafarge "Protects AR100," "Gold Bond Brand Hi-Abuse XP" by National Gypsum or approved equal, 48" wide, in maximum lengths available to minimize end-to-end butt joints.
  - 1. Board must achieve a Level 1 rating per ASTM C 1629.

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- H. Impact Resistant Wallboard: 1/2" and 5/8" thick as indicated on drawings, "Fibrock Brand VHI Abuse Resistant Panel" by USG, "DensArmor Plus Impact-Resistant Panels" by Georgia-Pacific Gypsum, "Gold Bond Brand Hi-Impact XP" by National Gypsum or approved equal, 48" wide, in maximum lengths available to minimize end-to-end butt joints.

### 2.4 ACCESSORIES

- A. Fasteners for Wall Board: USG Brand Screws or approved equal; 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.
  - 1. For Portland cement base boards, fasteners shall be equal to Durock Steel Screws by U.S. Gypsum or approved equal.
- B. Laminating Adhesive: "Sheetrock Brand Joint Compound" or approved equal
- C. Metal Trim - Corner Beads: For 90 degree External Corners - "Dur-A-Bead" No. 103, 27 U.S. Std. ga. galvanized steel, 1-1/4" x 1-1/4", for 90 degree external corners.
- D. Metal Trim - Edge Beads: "Sheetrock Brand Paper Faced Metal Bead and Trim" or approved equal
- 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.
  - 1. For mold-resistant drywall, water resistant drywall, and tile backer board, use glass mesh tape with setting joint compound that is rated 10 when tested in accordance with ASTM D 3273 and evaluated in accordance with ASTM D 3274. Acceptable joint compound is "Rapid Set One Pass" made by CTS Cement Manufacturing Corp. or "Rapid Joint" manufactured by Lafarge North America or approved equal meeting standards noted herein.
- F. Control Joints: No. 0.093, USG or approved equal.
- G. Acoustical Sealant: USG "Acoustical Sealant", "Tremco Acoustical Caulking" of Tremco Mfg. Co., or approved equal.
- H. Neoprene Gaskets: Conform to ASTM D 1056.

**PART 3 EXECUTION**

**3.1 INSPECTION**

- A. 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.

**3.2 GENERAL INSTALLATION REQUIREMENTS**

**A. General**

1. Install drywall work in accordance with drywall manufacturer's printed instructions and as indicated on drawings and specified herein.
2. 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.
3. 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.

- 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. Neatly cut wallboard to fit around outlets, switch boxes, framed openings, piping, ducts, and other items which penetrate wallboard; fill gaps with acoustic sealant.
6. 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.
7. 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.
8. 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.
- H. 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. Partition or furring abuts a structural element or dissimilar wall or ceiling.
  8. Partition or furring runs exceed 30' without interruption.
  9. 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.



**I. 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.

**3.3 FURRED WALLS AND PARTITIONS**

- A. 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.
- B. Wallboard Installation: Same as specified under Article 3.4 - "Metal Stud Partitions."

**3.4 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. Use channel type, positioned vertically in runners, spaced as noted on drawings, but not more than sixteen (16) inches o.c.
  2. 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.

3. 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.
  4. Connections for fire rated partitions at ceiling runners shall conform to UL Design #2079.
  5. 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.
  6. 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.
  7. 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.
  8. 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.
- 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. 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 so as to occur on different studs.

2. 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.
3. 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.
4. 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.
5. 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.
4. 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.

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- 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 Commissioner.
- 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 safig insulation.

### **3.5 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 at each furring channel; eight (8) inches o.c. at butt joints located not less than 3/8" from edges.

### 3.6 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 amount 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.

### 3.7 FINISHING

- A. Taping: A thin, uniform layer of 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 initial coat of compound has hardened, additional 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 compound has hardened, a finishing coat of 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.

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- D. **Fastener Depressions:** Compound shall be applied to all fastener depressions followed, when hardened by at least two (2) coats of compound, leaving all depressions level with the plane of the surface.
- E. **Finishing Beads and Trim:** 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 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. Level of finish for surface exposed to view shall conform to Level 4 of ASTM C 840 and GA-214 of the Gypsum Association.
- G. 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 City of New York.

### **3.8 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 Commissioner.
- 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.

### **3.9 PROTECTION OF WORK**

- A. Installer shall advise Contractor of required procedures for protecting drywall work from damage and deterioration during remainder of construction period.

**END OF SECTION**

**SECTION 093000**

**CERAMIC TILE**

**PART 1 GENERAL**

**1.1 GENERAL REQUIREMENTS**

- A. Work of this Section, as shown or specified, shall be in accordance with the Contract Documents.

**1.2 SECTION INCLUDES**

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the ceramic tile as shown on the drawings and/or specified herein, including, but not limited to, the following:
  - 1. Porcelain wall tile.
  - 2. Setting beds, grout, sealant and waterproofing membrane.

**1.3 RELATED SECTIONS**

- A. Masonry - Section 042000.
- B. Gypsum drywall - Section 092900.

**1.4 REFERENCES**

- A. ANSI A108 Series/A118 Series - American National Standards for Installation of Ceramic Tile.
- B. ANSI A136.1 - American National Standards for Organic Adhesives for Installation of Ceramic Tile.
- C. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar.
- D. ASTM C 150 - Standard Specification for Portland Cement.
- E. TCA (HB) - Handbook for Ceramic Tile Installation; Tile Council of America.
- F. ISO 13007 - International Standards Organization; classification for Grout and Adhesives.

**1.5 QUALITY ASSURANCE**

- A. Qualifications of Installers: For cutting, installing and grouting of ceramic tile, 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.

- B. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with the following:
  - 1. Manufacture all ceramic tiles 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.
- C. Exterior ceramic tile shall comply with the following:
  - 1. Frost Resistance, when tested in accordance with ISO 10545-12: No visible defects.
  - 2. Water Absorption, when tested in accordance with ISO 10545-3:  $\leq 0.5\%$

#### 1.6 SUBMITTALS

- A. Samples
  - 1. Before any ceramic tile is delivered to the job site, submit to the Commissioner sample panels, approx. 12" x 12", mounted on hardboard back-up with selected grout color for each color and pattern of ceramic tile and grout specified.
  - 2. Submit 12" x 12" samples of waterproofing membrane.
- B. Master Grade Certificates: Prior to opening ceramic tile containers, submit to the Commissioner 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.
- C. Mock-ups
  - 1. At an area on the site where approved by the Commissioner, provide a mock-up ceramic tile installation.
    - a. Make the mock-up approximately 4'-0" x 4'-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 Commissioner.
    - d. Revise as necessary to secure the Commissioner's approval.
  - 2. The mock-ups, when approved by the Commissioner, 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.

#### 1.7 PRODUCT HANDLING

##### A. Delivery and Storage

1. Deliver all materials of this Section to the job site in their original unopened containers with all labels intact and legible at time of use.
2. Store all materials under cover in a manner to prevent damage and contamination; store only the specified materials at the job site.

##### 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.

#### 1.8 PROJECT CONDITIONS

##### A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

##### 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.

#### 1.9 WARRANTY

##### A. Provide five (5) year material system warranty on mortar and grout from manufacturer.

##### B. Contractor shall provide a 1-year warranty for the installation and shall repair any tiles within that duration that crack, pop or deteriorate due to normal wear and tear.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS OF TILE

##### A. Manufacturers of tile to match schedules, TopCer.

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### **2.2 WALL TILE AND BASE**

- A. Exterior Porcelain Tile: 3" x 6" exterior unglazed porcelain ceramic tile, in colors as selected by the Commissioner.
- B. Provide sanitary cove base to match wall tile.

### **2.3 TRIM AND SPECIAL SHAPES**

- A. Provide external and internal corners, trim shapes at openings, and all other trim and special shapes to match the tile specified herein, as required by field conditions and drawing details.

### **2.4 MORTAR BED, BOND COAT AND GROUT**

- A. Portland Cement: ASTM C 150, Type I.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Sand: ASTM C 144, clean and graded natural sand.
- D. Latex Admixture for Mortar Bed
  - 1. MAPEI, Planicrete AC, blended with a 3:1 site mix.
  - 2. Laticrete 333.
  - 3. Pro Spec – Acrylic Additive.
  - 4. Custom Building Products – Flex Thin Set Additive.
  - 5. or approved equal
- E. Latex – Portland Cement Bond Coat, complying with ANSI A118.4 and ISO 13007, C2ES2P2.
  - 1. MAPEI, Keralastic System thin set mortar, consisting of Kerabond dry-set mortar and Keralastic latex admixture.
  - 2. Laticrete; 211 dry-set mortar and 4237 latex admixture.
  - 3. Pro Spec – Permalastic System consisting o Permalastic Dryset Mortar and Permalastic Admixture
  - 4. Custom Building Products – Mega Flex Crack Prevention Mortar.
  - 5. or approved equal
- F. Wall and Base Tile: Over masonry and concrete use a mortar bed leveling coat conforming to ANSI A108.1A followed by a Latex Portland Cement Bond Coat, MAPEI, Kerabond/Keralastic System, Custom Building Products Mega Flex or equal by Laticrete, Pro Spec or approved equal, conforming to ANSI A118.4, ISO 13007-C2ES2P2, and TCA Detail W-211.

- G. Wall and Base Tile: Over Cement Board comply with TCA Detail W-244E.
  - 1. Membrane shall be Laticrete 9235 with reinforcing or equivalent product by Mapei, Custom Building Products or approved equal.
- H. Water: Clean, fresh and suitable for drinking.
- I. Grout: For grouting ceramic tile, provide "SpectraLOCK PRO" made by Laticrete or equivalent product by Mapei, Custom Building Products or approved equal; exterior-rated, freeze-resistant, water-cleanable, stain-resistant epoxy grout conforming to ANSI A118.3; color as selected by the Commissioner. Add latex additive to grout made by same manufacturer as grout.
- J. Physical Properties: The setting beds and grouts must meet the following physical requirements:
  - 1. Compressive Strength – 3000 psi min.
  - 2. Shear Bond Strength – 500 psi min.
  - 3. Water Absorption – 4.0% max.
  - 4. Service Rating (ASTM C 627) – Extra Heavy Duty.
- K. Sealer: Seal all grout joints and all unglazed tile using "Sealer's Choice 15 Gold" by Aqua Mix Inc. or equivalent product by Custom Building Products, Mapei or approved equal.
- L. Temporary Protective Coating: Either product indicated below that is applied in the tile manufacturer's factory and formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
  - 1. Petroleum paraffin wax, applied hot, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg. F. per ASTM D 87.
  - 2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.
- M. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, equal to "Concentrated Stone & Tile Cleaner" made by Aqua-Mix or approved equal, specifically approved for materials and installations indicated by tile and grout manufacturers.

**2.5 SEALANT**

- A. Joint Backing: Preformed, compressible, resilient, non-extruding, non-staining strips of foam neoprene, foam polyethylene, or other material recommended by sealant manufacturer.
- B. Bond Breaker: Polyethylene tape, 3 mils thick or other material recommended by sealant manufacturer.
- C. Sealant Primer: Colorless, non-staining, or type to suit substrate surface, as recommended by sealant manufacturer.
- D. Sealant: One-part silicone based sanitary sealant, conforming to ASTM C 920, Type S, Grade NS, Class 25. Sealant hardness upon full cure shall be between 20-30 Shore "A" Durometer. Color of sealant to blend with or match adjacent materials, and as selected by the Commissioner. Sealant shall be "1700 Sanitary Sealant" by General Electric, "Dow Corning 786" by Dow Corning Corporation, "Latasil Tile and Stone Sealant" by Laticrete or approved equal.

**PART 3 EXECUTION**

**3.1 INSPECTION**

- A. Examine the areas and conditions where ceramic tile 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. Grind or fill concrete and masonry substrates as required to comply with allowable variations.

**3.3 PREPARATION**

- A. Blending: for tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of 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. Field Applied Temporary Protective Coating: Pre-coat tile with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

**3.4 JOINTS IN TILE WORK**

- A. Joint Widths: 1/16" wide in ceramic tile.
- B. Alignment: Wall, base and floor joints shall align through the field and trim. Direction and location of all joints as directed by Commissioner.

- C. Movement Joints: Conform to TCA Detail EJ171. Locate where movement joints are in back-up material. Provide movement joint at joints between mop receptors and ceramic tile. Provide movement joint at all vertical internal joints of wall tile. Movement joints 1/8" wide in ceramic tile. Fill all movement joints with specified backing and sealant. Use bond breaker where sufficient space for joint backing does not exist.
  - 1. Provide sealant between ceramic tile and plumbing fixtures, mirrors, pipes, countertops and other dissimilar materials penetrating or adjacent to ceramic tile.

### 3.5 INSTALLATION

- A. Comply with the following installation standards
  - 1. Exterior wall tile over masonry: TCA Detail W-211.
- B. All setting beds and/or adhesives shall provide for an average contact area of not less than 95% coverage.
- C. Allowable Variations in Finished Work: Do not exceed the following deviations from level and plumb, and from elevations, locations, slopes and alignment shown.
  - 1. Walls: 1/8" in 8'-0" run, any direction; 1/8" at any location; offset at any location, 1/32".
  - 2. Joints: +/- 1/32" joint width variation of any location; 1/16" in 3'-0" run deviation from plumb and true.
- D. Handle, store, mix and apply setting and grouting materials in compliance with the manufacturer's instructions.
- E. Extend tile work into recesses and under equipment and fixtures, to form a complete covering without interruptions. Terminate work neatly at obstructions, edges and corners without disruption of pattern or joint alignment.
- F. Accurately 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 and fixtures so that plates, collars, or covers overlap tile.
- G. Lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are the same size. Lay out tile work and center tile fields both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths.

**3.6 CLEANING AND PROTECTION**

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
  - 1. Remove grout residue from tile as soon as possible.
  - 2. 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.
  - 3. 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. Protect installed tile work with Kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. Apply coat of sealer to all grout joints and all unglazed tile.
- C. Before final inspection, remove protective coverings from tile surfaces.
- D. Leave finished installation clean and free of cracked, chipped, broken, unbonded or otherwise defective tile work.

**END OF SECTION**

**SECTION 096513**

**RESILIENT BASE AND 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 SECTION INCLUDES**

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the resilient accessories, as shown on the drawings and/or specified herein, including, but not limited to, the following:
  - 1. Vinyl base.
  - 2. Accessories.

**1.3 RELATED SECTIONS**

- A. Gypsum Board Assemblies - Section 092900.

**1.4 QUALITY ASSURANCE**

- A. 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.

**1.5 SUBMITTALS**

- A. Manufacturer's Data: For information only, submit manufacturer's technical information and installation instructions for type of resilient base.
- B. Samples: Submit six (6) inch long samples of base.

**1.6 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.

**1.7 JOB CONDITIONS**

- A. Continuously heat spaces to receive base to a temperature of seventy (70) degrees F. for at least forty-eight (48) hours prior to installation, whenever project conditions are such that heating is required. Maintain seventy (70) degrees F. temperature continuously during and after installation as recommended by the manufacturer, but for not less than forty-eight (48) hours. Maintain a temperature of not less than fifty-five (55) degrees F. in areas where work is completed.

**PART 2 PRODUCTS**

**2.1 VINYL BASE**

- A. Provide four (4) inches high, 1/8" thick, continuous vinyl, top set cove base with pre-formed internal and external corner pieces, color as scheduled. Base shall conform to ASTM F 1861, Type TV, Group 1 as manufactured by Burke Mercer, Marley Flexco, Johnsonite, Roppe, or approved equal.

**2.2 ACCESSORIES**

- A. Adhesives: Waterproof, stabilized type, as recommended by the manufacturer for the type of service indicated.

**PART 3 EXECUTION**

**3.1 INSPECTION**

- A. Examine the areas and conditions where resilient base 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 RESILIENT BASE**

- A. 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.

**3.3 CLEANING AND PROTECTION**

- A. Remove any excess adhesive or other surface blemishes from base using neutral type cleaners as recommended by the manufacturer.

**END OF SECTION**



**SECTION 099000**

**PAINTING AND FINISHING**

**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 painting and finishing as shown on the drawings and/or specified herein, including, but not limited to, the following:
  - 1. Prime painting unprimed surfaces to be painted under this Section.
  - 2. Painting all items furnished with a prime coat of paint, including touching up of or repairing of abraded, damaged or rusted prime coats applied by others.
  - 3. Painting all ferrous metal (except stainless steel) exposed to view.
  - 4. Painting all galvanized ferrous metals exposed to view.
  - 5. Painting gypsum drywall exposed to view.
  - 6. Painting of concrete masonry units.
  - 7. Painting pipes, pipe coverings, conduit, ducts, insulation, hangers, supports and other mechanical and electrical items and equipment exposed to view.
  - 8. Painting surfaces above, behind or below grilles, gratings, diffusers, louvers, lighting fixtures, and the like, which are exposed to view through these items.
  - 9. Incidental painting and touching up as required to produce proper finish for painted surfaces, including touching up of factory finished items.
  - 10. Painting of any surface not specifically mentioned to be painted herein or on drawings, but for which painting is obviously necessary to complete the job, or work which comes within the intent of these specifications, shall be included as though specified.

**1.3 RELATED SECTIONS**

- A. Shop priming is required on some, but not all of the items scheduled to be field painted. Refer to other Sections of work for complete description.

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- B. Shop Coat on Machinery and Equipment: Refer to the Sections under which various items of manufactured equipment with factory applied shop prime coats are furnished, including, but not necessarily limited to, the following Sections. All items of equipment furnished with prime coat finish shall be finish painted under this Section.

- 1. Plumbing - Division 22.
- 2. Heating, ventilation and air conditioning - Division 23.

- C. Color Coding of Mechanical Piping and Electrical Conduits - Divisions 22 and 26.

- 1. This Color Coding consists of an adhesive tape system and is in addition to painting of piping and conduits under this Section, as specified above.

### **1.4 MATERIALS AND EQUIPMENT NOT TO BE PAINTED**

- A. Items of equipment furnished with complete factory finish, except for items specified to be given a finish coat under this Section.
- B. Factory paint metals
- C. Factory powder coated aluminum grilles.
- D. Factory-finished acoustical tile.
- E. Shop-painted exterior hollow metal doors.
- F. Non-ferrous metals, except for items specified and/or indicated to be painted.
- G. Finished hardware, excepting hardware that is factory primed.
- H. Surfaces not to be painted shall be left completely free of droppings and accidentally applied materials resulting from the work of this Section.

### **1.5 QUALITY ASSURANCE**

- A. Job Mock-Up
  - 1. In addition to the samples specified herein to be submitted for approval, apply in the field, at their final location, each type and color of approved paint materials, applied 10 feet wide, floor to ceiling of wall surfaces, before proceeding with the remainder of the work, for approval by the Commissioner. Paint mock-ups to include door and frame assembly.
  - 2. These applications when approved will establish the quality and workmanship for the work of this Section.
  - 3. Repaint individual areas which are not approved, as determined by the Commissioner, until approval is received. Assume at least two paint mock-ups of each color and gloss for approval.

- B. Qualification of Painters: Use only qualified journeyman painters for the mixing and application of paint on exposed surfaces.
- C. Paint Coordination: Provide finish coats which are compatible with the prime paints used. Review other Sections of these specifications in which prime paints are to be provided to ensure compatibility of the total coatings system for the various substrates. Upon request from other subcontractors, furnish information on the characteristics of the finish materials proposed to be used, to ensure that compatible prime coats are used. Provide barrier coats over incompatible primers or remove and re-prime as required. Notify the Commissioner in writing of any anticipated problems using the coating systems as specified with substrates primed by others.
- D. All paints must conform to the Volatile Organic Compounds (VOC) standards of prevailing codes and ordinances.

#### 1.6 SUBMITTALS

##### A. Materials List

- 1. Before any paint materials are delivered to the job site, submit to the Commissioner a complete list of all materials proposed to be furnished and installed under this portion of the work.
- 2. This shall in no way be construed as permitting substitution of materials for those specified or accepted for this work by the Commissioner.

##### B. Samples

- 1. Accompanying the materials list, submit to the Commissioner copies of the full range of colors available in each of the proposed products.
- 2. Upon direction of the Commissioner, prepare and deliver to the Commissioner two (2) identical sets of Samples of each of the selected colors and glosses painted onto 8-1/2" x 11" x 1/4" thick material; whenever possible, the material for Samples shall be the same material as that on which the coating will be applied in the work.

- C. Manufacturer's Recommendations: In each case where material proposed is not the material specified or specifically described as an acceptable alternate in this Section of these specifications, submit for the Commissioner's review the current recommended method of application published by the manufacturer of the proposed material.

#### 1.7 PRODUCT HANDLING

- A. Deliver all paint materials to the job site in their original unopened containers with all labels intact and legible at time of use.

**B. Protection**

1. Store only the approved materials at the job site, and store only in a suitable and designated area restricted to the storage of paint materials and related equipment.
2. Use all means necessary to ensure the safe storage and use of paint materials and the prompt and safe disposal of waste.
3. Use all means necessary to protect paint materials before, during and after application 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.

**1.8 EXTRA STOCK**

- A. Upon completion of this portion of the Work, deliver to the City of New York an extra stock of paint equaling approximately ten (10) percent of each color and gloss used and each coating material used, with all such extra stock tightly sealed in clearly labeled containers.

**1.9 JOB CONDITIONS**

- A. Apply water-based paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 50 degrees F. and 90 degrees F., unless otherwise permitted by the paint manufacturer's printed instructions.
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 45 degrees F. and 95 degrees F. unless otherwise permitted by the paint manufacturer's printed instructions.
- C. Do not apply paint in snow, rain, fog or mist; or when the relative humidity exceeds eighty-five (85) percent; or to damp or wet surfaces; unless otherwise permitted by the paint manufacturer's printed instructions.
- D. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified by the paint manufacturer during application and drying periods.

## **PART 2 PRODUCTS**

### **2.1 PAINT MANUFACTURERS**

- A. Except as otherwise noted, provide the painting products listed for all required painting made by one of the manufacturers listed in the paint schedule (Paragraph 2.4) or approved equal. These companies are Benjamin Moore, PPG, Akzo Nobel Paint (Glidden Professional), Sherwin Williams (S-W), and Pratt and Lambert Paint. Comply with number of coats and required minimum mil thicknesses as specified herein.

### **2.2 MATERIALS**

- A. Provide undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer, and use only to recommended limits.
- B. Colors and Glosses: All colors and glosses shall be as selected by the Commissioner. Certain colors will require paint manufacturer to prepare special factory mixes to match colors selected by the Commissioner. Color schedule (with gloss) shall be furnished by the Commissioner.
- C. Coloring Pigment: Products of or furnished by the manufacturer of the paint or enamel approved for the work.
- D. Linseed Oil: Raw or boiled, as required, of approved manufacture, per ASTM D 234 and D 260, respectively.
- E. Turpentine: Pure distilled gum spirits of turpentine, per ASTM D 13.
- F. Shellac: Pure gum shellac (white or orange) cut in pure denatured alcohol using not less than four (4) lbs. of gum per gallon of alcohol.
- G. Driers, Putty, Spackling Compound, Patching Plaster, etc.: Best quality, of approved manufacture.
- H. Heat Resistant Paint: Where required, use heat resistant paint when applying paint to heating lines and equipment.

### **2.3 GENERAL STANDARDS**

- A. The various surfaces shall be painted or finished as specified below in Article 2.4. However, the Commissioner reserves the right to change the finishes within the range of flat, semi-gloss or gloss, without additional cost to the City of New York.
- B. All paints, varnishes, enamels, lacquers, stains and similar materials must be delivered in the original containers with the seals unbroken and label intact and with the manufacturer's instructions printed thereon.
- C. All painting materials shall bear identifying labels on the containers with the manufacturer's instructions printed thereon.

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- D. Paint shall not be badly settled, caked or thickened in the container, shall be readily dispersed with a paddle to a smooth consistency and shall have excellent application properties.
- E. Paint shall arrive on the job color-mixed except for tinting of under-coats and possible thinning.
- F. All thinning and tinting materials shall be as recommended by the manufacturer for the particular material thinned or tinted.
- G. It shall be the responsibility of the Contractor to see that all mixed colors match the color selection made by the Commissioner prior to application of the coating.

### 2.4 SCHEDULE OF FINISHES

#### A. Exterior Galvanized Ferrous Metal

- Primer        Moore IMC Acrylic Metal Primer (M04)  
                 Akzo Devflex 4020 FF DTM Primer/Flat Finish  
                 Sherwin-Williams Galvite HS Primer, B50WZ30  
                 Pratt and Lambert; 1 or 2 coats Steeltech Acrylic Prime or Finish, Z190  
                 Or approved equal
- First Coat:   Moore Urethane Alkyd Gloss Enamel (Z22)  
                 Akzo Devflex 4216 High Performance WB Acrylic S/G  
                 Sherwin-Williams Industrial Enamel HS, B54Z-400  
                 Pratt and Lambert Enducryl DTM Acrylic, SCZ6611  
                 Or approved equal
- Second Coat: Same as recommended first coat.

#### B. High Performance Coating On Exterior Galvanized Ferrous Metals

- First Coat:   "27 Typoxy" or "N69 Epoxoline II" by Tnemec; "Intergard 345" by International Protective Coatings; "Carboguard 893 SG" or "Carboguard 888" by Carboline; "Devran 203 WB Epoxy Primer" by Akzo; "Recoatable Epoxy Primer 867-45" by Sherwin Williams; or approved equal
- Second Coat: "V73 Endura Shield" or "1074/1075" by Tnemec; "Interthane 870UHS" or "990 UHS" by International Protective Coatings; "Carbothane 133 LH" by Carboline; "Devthane 379H Aliphatic Vizethne" by Akzo; "Hi-Solids Urethane B65-300/350" by Sherwin Williams; or approved equal

**C. High Performance Coating On Exterior Non-Galvanized Ferrous Metals**

- Prime Coat: "Tneme-Zinc 90/97" by Tnemec; "Interzinc 52" or "315" by International Protective Coatings; "Carbozinc 859, Class B" by Carboline; "Cathacoat 302V Reinforced Inorganic Zinc Primer" by Akzo; or "Zinc Clad II Plus Inorganic Zinc Rich Coating B69V212" by Sherwin Williams; or approved equal
- Second Coat: "27 Typoxy" or "N69 Epoxoline II" by Tnemec; "Intergard 345" by International Protective Coatings; "Carboguard 893 SG" or "Carboguard 888" by Carboline; "Bar-Rust 231V Multi Purpose Epoxy Mastic" by Akzo; or "Macropoxy G46 I.C. Epoxy B58-600" by Sherwin Williams; or approved equal
- Third Coat: "V73 Endura Shield" or "1074/1075" by Tnemec; "Interthane 870UHS" or "990 UHS" by International Protective Coatings; "Carbothane 133 LH" by Carboline; "Devthane 379H Aliphatic Urethane" by Akzo; or "Hi-Solids Polyurethane B65-300/350" by Sherwin Williams; or approved equal

**D. Interior Concrete Block**

**Flat Finish/Vinyl Acrylic Latex over Filler**

- Block Filler: 1 coat Moorcraft Super Craft Latex Block Filler (285)  
1 coat Akzo Glidden Professional Concrete Coatings Block Filler GP 3010-1200  
1 coat S-W Preprite Block Filler, B25W25  
1 coat Pratt and Lambert; Pro Hide Silver Interior/Exterior Latex Block Filler Z8485  
Or approved equal
- First Coat: 1 coat Regal Wall Satin (215)  
1 coat Akzo Glidden Professional Diamond 350 Flat GP 1201  
1 coat S-W Promar 200 Interior Latex Flat, B30-2600  
1 coat Pratt and Lambert; Pro Hide Gold Interior Latex Flat Z8100  
Or approved equal
- Second Coat: 1 coat Regal Wall Satin (215)  
1 coat Akzo Glidden Professional Diamond 350 Flat GP 1201  
1 coat S-W Promar 200 Interior Latex Flat, B30-2600  
1 coat Pratt and Lambert; Pro Hide Gold Interior Latex Flat Z8100  
Or approved equal
- a. Total DFT not less than: 10.7 mils

**Eggshell Finish/Vinyl Acrylic Latex over Filler**

- Block Filler: 1 coat Moorcraft Super Craft Latex Block Filler (285)  
1 coat Akzo Glidden Professional Concrete Coatings Block Filler GP 3010-1200  
1 coat S-W Preprite Block Filler, B25W25  
1 coat Pratt and Lambert; Pro Hide Silver Interior/Exterior Latex Block Filler Z8485  
Or approved equal

## HARPER STREET YARD

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- First Coat: 1 coat Regal AquaVelvet (319)  
1 coat Akzo Glidden Professional Diamond 350 Acrylic Eggshell  
6P1403  
1 coat S-W Promar 200 Interior Latex Eggshell, B20-2600  
1 coat Pratt and Lambert; Pro Hide Gold Interior Latex Eggshell  
Z8200  
Or approved equal
- Second Coat: 1 coat Regal AquaVelvet (319)  
1 coat Akzo Glidden Professional Diamond 350 Acrylic Eggshell  
6P1403  
1 coat S-W Promar 200 Interior Latex Eggshell, B30-2600  
1 coat Pratt and Lambert; Pro Hide Gold Interior Latex Eggshell  
Z8200  
Or approved equal
- a. Total DFT not less than: 10.9 mils

### Semi-Gloss Finish/Vinyl Acrylic Latex over Filler

- Block Filler: 1 coat Moorcraft Super Craft Latex Block Filler (285)  
1 coat Akzo Glidden Professional Concrete Coatings Block Filler  
GP 3010-1200  
1 coat S-W Preprite Block Filler, B25W25  
1 coat Pratt and Lambert; Pro Hide Silver Interior/Exterior Latex  
Block Filler Z8485  
Or approved equal
- First Coat: 1 coat Regal AquaGlo (333)  
1 coat Akzo Glidden Professional Diamond 350 Acrylic S/G GP  
1407  
1 coat S-W Promar 200 Interior Latex S. Gloss, B31-2600  
1 coat Pratt and Lambert Pro Hide Gold Interior Latex Semi-Gloss  
Z8300  
Or approved equal
- Second Coat: 1 coat Regal AquaGlo (333)  
1 coat Akzo Glidden Professional Diamond 350 Acrylic S/G GP  
1407  
1 coat S-W Promar 200 Interior Latex S. Gloss, B31-2600  
1 coat Pratt and Lambert Pro Hide Gold Interior Latex Semi-Gloss  
Z8300  
Or approved equal
- a. Total DFT not less than: 10.7 mils

## E. Interior Ferrous Metal

### Satin Finish/Latex

- Primer: 1 coat Moore Alkyd Metal Primer (Z06)  
1 coat Akzo Devflex 4020 PF DTM Prime/Flat Finish or touch-up  
shop primer  
1 coat Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer  
B66-310  
1 coat Pratt and Lambert Steeltech Acrylic Prime or Finish Z190  
Or approved equal



**HARPER STREET YARD**  
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- First Coat: 1 coat Water Borne Satin Impervo (314)  
1 coat Akzo: Glidden Professional Diamond 350 Acrylic Eggshell 6P1403  
1 coat S-W Pro-Classic Waterborne Acrylic Satin, B20  
1 coat Pratt and Lambert Red Seal Latex Satin Enamel Z2300  
Or approved equal
- Second Coat: 1 coat Water Borne Satin Impervo (314)  
1 coat Akzo: Glidden Professional Diamond 350 Acrylic Eggshell 6P1403  
1 coat S-W Pro-Classic Waterborne Acrylic Satin, B20  
1 coat Pratt and Lambert Red Seal Latex Satin Enamel Z2300  
or Pro-Hide Gold Interior Latex Satin Z9490  
Or approved equal  
a. Total DFT not less than: 3.9 mils

**Semi-Gloss Finish/Latex**

- Primer: 1 coat Iron Clad Latex Low Lustre Metal & Wood Enamel (363)  
1 coat Akzo Devflex 4020 PF DTM Primer/Flat Finish or touch-up shop primer.  
1 coat Sherwin-Williams, Pro Industrial Pro-Cryl Universal Primer B66-310  
1 or 2 coats Pratt and Lambert; Steeltech Acrylic Prime or Finish Z190  
Or approved equal
- First Coat: 1 coat Regal ICI Premium Interior 100% Acrylic Semi-gloss Finish (N333)  
1 coat Akzo: Glidden Professional Diamond 350 Acrylic S/G 6P1407  
1 coat S-W Pro-Classic Waterborne Acrylic Satin, B31  
1 coat Pratt and Lambert; Pro Hide Gold Interior Latex Semi-Gloss Z8300  
Or approved equal
- Second Coat: 1 coat Regal Premium Interior 100% Acrylic Semi-Gloss finish (N333)  
1 coat Akzo: Glidden Professional Diamond 350 Acrylic S/G 6P1407  
1 coat S-W Pro-Classic Waterborne Acrylic Satin, B31  
1 coat Pratt and Lambert; Pro Hide Gold Interior Latex Semi-Gloss Z8300  
Or approved equal  
a. Total DFT not less than: 4.0 mils

**F. Interior Drywall**

**Flat Finish/Vinyl Acrylic Latex**

- Primer: 1 coat Regal FirstCoat (216)  
1 coat Akzo Glidden Professional Gripper GP 3210  
1 coat S-W Pro Green 200 Interior Latex Primer, B28-600  
1 coat Pratt and Lambert Pro Hide Gold Interior Latex Wall Primer Z8160  
Or approved equal

## **HARPER STREET YARD**

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First Coat: 1 coat Regal Wall Satin (215)  
1 coat Akzo Glidden Professional Diamond 350 Flat GP 1201  
1 coat S-W Pro Green 200 Interior Latex Flat, B30-600  
1 coat Pratt and Lambert; Pro Hide Gold Interior Latex Flat Z8100  
Or approved equal

Second Coat: 1 coat Regal Wall Satin (215)  
1 coat Akzo Glidden Professional Diamond 350 Flat GP 1201  
1 coat S-W Pro Green 200 Interior Latex Flat, B30-600  
1 coat Pratt and Lambert; Pro Hide Gold Interior Latex Flat Z8100  
Or approved equal  
a. Total DFT not less than: 3.6 mils

### **Eggshell Finish/Vinyl Acrylic Latex**

Primer: 1 coat Regal FirstCoat (216)  
1 coat Akzo Glidden Professional Gripper GP 3210  
1 coat S-W Pro Green 200 Interior Latex Primer, B28-600  
1 coat Pratt and Lambert Pro Hide Gold Interior Latex Wall Primer Z8160  
Or approved equal

First Coat: 1 coat Regal AquaVelvet (319)  
1 coat Akzo Glidden Professional Diamond 350 Acrylic Eggshell GP 1403  
1 coat S-W Pro Green 200 Interior Latex Egg-Shell, B20-600  
1 coat Pratt and Lambert; Pro Hide Gold Interior Latex Eggshell Z8200  
Or approved equal

Second Coat: 1 coat Regal AquaVelvet (319)  
1 coat Akzo Glidden Professional Diamond 350 Acrylic Eggshell GP 1403  
1 coat S-W Pro Green 200 Interior Latex Egg-Shell, B20-600  
1 coat Pratt and Lambert; Pro Hide Gold Interior Latex Eggshell Z8200  
Or approved equal  
a. Total DFT not less than: 3.8 mils

### **G. Primer for Paperless Drywall (Mold Resistant):**

1 coat Golden Prep and Primer Gripper Multi-Purpose Interior/Exterior Water Based Primer Sealer 3210-1200  
1 coat Pratt & Lambert "Suprime" Interior Latex Enamel Undercoater Z1013/F1013  
1 coat Sherwin Williams "Builders Solution"  
1 coat Benjamin Moore 046 Fresh Start Acrylic Superior Primer  
Or approved equal

**2.5 EXISTING SURFACES TO BE PAINTED**

- A. Existing surfaces shall be painted in accordance with schedule given in Article 2.4 herein except that first or prime coat may be eliminated where existing paint is sound. Where existing paint must be removed down to base material, provide first or prime coat as specified.

**2.6 PIPING AND MECHANICAL EQUIPMENT EXPOSED TO VIEW**

- A. Paint all exposed piping, conduits, ductwork and mechanical and electrical equipment. Use heat resisting paint when applied to heating lines and equipment. The Contractor is cautioned not to paint or otherwise disturb moving parts in the mechanical systems. Mask or otherwise protect all parts as required to prevent damage.
- B. Exposed Uncovered Ductwork, Piping, Hangers and Equipment: Latex Enamel Undercoater and one (1) coat Acrylic Latex Flat.
- C. Exposed Covered Piping, Duct Work and Equipment: Primer/Sealer and one (1) coat Acrylic Latex Flat.
- D. Panel Boards, Grilles and Exposed Surfaces of Electrical Equipment: Latex Enamel Undercoater and two (2) coats Latex Semi-Gloss.
- E. Equipment or Apparatus with Factory-Applied Paint: Refinish any damaged surfaces to match original finish. Do not paint over name plates and labels.
- F. All surfaces of insulation and all other work to be painted shall be wiped or washed clean before any painting is started.
- G. All conduit, boxes, distribution boxes, light and power panels, hangers, clamps, etc., are included where painting is required.
- H. All items of Mechanical and Electrical trades which are furnished painted under their respective Contracts shall be carefully coordinated with the work of this Section so as to leave no doubt as to what items are scheduled to be painted under this Section.

**PART 3 EXECUTION**

**3.1 INSPECTION**

- A. Examine the areas and conditions where painting and finishing are to be applied 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 GENERAL WORKMANSHIP REQUIREMENTS**

- A. Only skilled mechanics shall be employed. Application may be by brush or roller. Spray application only upon acceptance from the Commissioner in writing.

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- B. The Contractor shall furnish the Commissioner 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.
- C. The Contractor shall protect his work at all times, and shall protect all adjacent work and materials by suitable covering or other method during progress of his work. Upon completion of the work, he shall remove all paint and varnish spots from floors, glass and other surfaces. He shall remove from the premises all rubbish and accumulated materials of whatever nature not caused by others and shall leave his part of the work in clean, orderly and acceptable condition.
- D. Remove and protect hardware, accessories, device plates, lighting fixtures, and factory finished work, and similar items, or provide ample in place protection. Upon completion of each space, carefully replace all removed items by workmen skilled in the trades involved.
- E. Remove electrical panel box covers and doors before painting walls. Paint separately and re-install after all paint is dry.
- F. All materials shall be applied under adequate illumination, evenly spread and flowed on smoothly to avoid runs, sags, holidays, brush marks, air bubbles and excessive roller stipple.
- G. Coverage and hide shall be complete. When color, stain, dirt or undercoats show through final coat of paint, the surface shall be covered by additional coats until the paint film is of uniform finish, color, appearance and coverage, at no additional cost to the City of New York.
- H. All coats shall be dry to manufacturer's recommendations before applying succeeding coats.
- I. All suction spots or "hot spots" in plaster after the application of the first coat shall be touched up before applying the second coat.
- J. Do not apply paint behind frameless mirrors that use mastic for adhering to wall surface.

### **3.3 PREPARATION OF SURFACES**

- A. Existing Surfaces: Clean existing surfaces requiring paint or finishing, remove all loose and flaking paint or finish and sand surface smooth as required to receive new paint or finish. No "telegraphing" of lines, ridges, flakes, etc., through new surfacing is permitted. Where this occurs, Contractor shall be required to sand smooth and re-finish until surface meets with Commissioner's approval.

**B. General**

1. The Contractor shall be held wholly responsible for the finished appearance and satisfactory completion of painting work. Properly prepare all surfaces to receive paint, which includes cleaning, sanding, and touching-up of all prime coats applied under other Sections of the work. Broom clean all spaces before painting is started. All surfaces to be painted or finished shall be perfectly dry, clean and smooth.
2. Perform all preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified, for each particular substrate condition.
3. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning. Program the cleaning and painting so that dust and other contaminants from the cleaning process will not fall in wet, newly painted surfaces.

**C. 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.

**D. Metal Surfaces**

1. **Weld Fluxes:** Remove weld fluxes, splatters, and alkali contaminants from metal surfaces in an approved manner and leave surface ready to receive painting.
2. **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.
  - a. 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.
3. **Shop Primed Metal:** Clean off foreign matter as specified for "Bare Metal." Prime bare, rusted, abraded and marred surfaces with approved primer after proper cleaning of surfaces. Sandpaper all rough surfaces smooth.
4. **Galvanized Metal:** Prepare surface as per the requirements of ASTM D 6386.

5. **Metal Filler:** Fill dents, cracks, hollow places, open joints and other irregularities in metal work to be painted with an approved metal filler suitable for the purpose and meeting the requirements of the related Section of work; after setting, sand to a smooth, hard finish, flush with adjoining surface.
- E. **Gypsum Drywall Surfaces:** Scrape off all projections and splatters, spackles all holes or depressions, including taped and spackled joints, sand smooth. Conform to standards established in Section 092900, "Gypsum Drywall."
- F. **Testing for Moisture Content:** Contractor shall test all plaster, masonry, and drywall surfaces for moisture content using a reliable electronic moisture meter. Contractor shall also test latex type fillers for moisture content before application of top coats of paint. Do not apply any paint or sealer to any surface or to latex type filler where the moisture content exceeds seven (7) percent as measured by the electronic moisture meter.
- G. **Touch-Up:** Prime paint all patched portions in addition to all other specified coats.

### 3.4 MATERIALS PREPARATION

- A. Mix and prepare painting materials in strict accordance with the manufacturer's directions.
- B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing, and application of paint in a clean condition, free of foreign materials and residue.
- C. Stir all materials before application to produce a mixture of uniform density, and as required during the application of the materials. Do not stir any film which may form on the surface into the material. Remove the film and, if necessary, strain the material before using.
- D. Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are to be applied. Tint undercoats to match the color of the finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

### 3.5 APPLICATION

- A. **General**
  1. Apply paint by brush or roller in accordance with the manufacturer's directions. Use brushes best suited for the type of material being applied. Use rollers of carpet, velvet back, or high pile sheep's wool as recommended by the paint manufacturer for material and texture required.

2. The number of coats and paint film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has completely dried. Sand between each 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.
3. Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance. Give special attention to insure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a film thickness equivalent to that of flat surfaces.
4. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  - a. "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.
5. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint, before final installation of equipment.
6. Paint the back sides of access panels, removable or hinged covers to match the exposed surfaces.
7. Finish doors on tops, bottoms, and side edges the same as the faces, unless otherwise indicated.
8. Enamel finish applied to wood or metal shall be sanded with fine sandpaper and then cleaned between coats to produce an even surface.

**B. Scheduling Painting**

1. Apply the first coat material to surfaces that have been cleaned, pre-treated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
2. Allow sufficient time between successive coatings to permit proper drying. Do not re-coat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

**C. Prime Coats:** Re-coat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

**D. Pigmented (Opaque) Finishes:** Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage.

- E. "Touching-Up" of Factory Finishes: Unless otherwise specified or shown, materials with a factory finish shall not be painted at the project site. To "touch-up," the Contractor shall use the factory finished material manufacturer's recommended paint materials to repair abraded, chipped, or otherwise defective surfaces.

**3.6 PROTECTION**

- A. Protect work of other trades, whether to be painted or not, against damage by the painting and finishing work. Leave all such work undamaged. Correct any damages by cleaning, repairing or replacing, and repainting, as acceptable to the Commissioner.
- B. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

**3.7 CLEAN UP**

- A. During the progress of the work, remove from the site all discarded paint materials, rubbish, cans and rags at the end of each work day.
- B. Upon completion of painting work, clean window glass and other paint spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.
- C. At the completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

**END OF SECTION**



**SECTION 099100**

**PAINTING - DIESEL FUEL SYSTEM**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

The Contractor shall furnish all labor, materials, tools, and equipment and complete the painting work, as required by the Contract Documents.

**1.02 DEFINITIONS**

The term "primer" as used in this Section means the primer, sealer, filler or other first coat material recommended for the substrate by the manufacturer of the finish coat material, except where a specific primer is specified.

**1.03 SUBMITTALS**

The following items shall be submitted to the Construction Manager for approval in accordance with SECTION: SUBMITTALS.

- A. Product Data: Manufacturer's product literature including a statement stating the percentage of solids by volume. In addition, submit manufacturer's printed instructions and recommendations for surface preparation, priming, mixing, reduction, spreading rate, application and storage, as applicable for each type of paint or primer.
- B. Certification from the manufacturer that the paints, solvents, varnishes and architectural coatings conform to the New York City's Air Pollution Control Code. This certification shall list the total volume of photochemically reactive solvents contained in the particular products.
- C. Federal Specifications: A statement from the manufacturer stating that the material meets or exceeds the performance requirements of the federal specifications and comply with all other Contract requirements.

**PART 2 - PRODUCTS**

**2.01 MATERIALS**

- A. Primers, sealers, and undercoats as recommended by the finish paint manufacturer, shall meet or exceed the following requirements:
  - 1. Metal Primer (Zinc Dust, Zinc Oxide): FS TT-P-641
  - 2. Metal Primer (Zinc, Yellow Iron Oxide): MIL P2441/20-FS-TT-P-641
  - 3. Alkyd Primer: MIL P53030
  - 4. Bonding Undercoat: For new copper and galvanized steel surfaces; Galv-A-Grip by DAP Inc., Dayton, OH; or Series 3202 by Rust-Oleum Corp., Evanston, IL

- B. Finish paints shall be compatible with the primers, sealers and undercoating materials, and shall meet or exceed the following requirements:
  - 1. Exterior Alkyd Paint, Gloss: FS TT-P-00102C, C.I.D., AA 3067
  - 2. Alkyd Enamel, Gloss: FS TT-E-489, C.I.D., A-A 2962
  - 3. Latex Semi-Gloss Enamel: FS-TT-P-29
  - 4. Coal Tar Epoxy: Bitumastic 300-M by Koppers Co., Inc., Pittsburgh, PA or Series 875 by Pittsburgh Paints, Pittsburgh, PA
- C. Miscellaneous Materials shall meet or exceed the following requirements:
  - 1. Mineral Spirits (Petroleum Paint Thinner): FS TT-T-291, Grade 1
  - 2. Cleaning Solvents: Low toxicity and a flash point in excess of 100 degrees Fahrenheit

### **PART 3 - EXECUTION**

#### **3.01 GENERAL**

- A. The Contractor shall comply with manufacturer's printed instructions under which coating and appurtenant materials shall be applied.
- B. The Contractor shall not apply primer or paint coating in areas where dust is being generated or will be generated while the finish coat is drying.
- C. Materials selected for each system type shall be the product of a single manufacturer.

#### **3.02 DELIVERY, STORAGE, AND HANDLING**

- A. All materials delivered to the site shall be in original, new unopened containers, and shall include manufacturer's printed labels.
- B. The Contractor shall keep storage space clean and accessible to the Construction Manager at all times.
- C. All materials placed in storage shall be protected from weather, humidity, temperature variation, dirt and dust, and other contaminants.

#### **3.03 PREPARATION OF SURFACES**

- A. The Contractor shall clean and prepare the surfaces before applying primer or paint in accordance with the paint manufacturer's instructions for the particular substrate conditions.
- B. The Contractor shall broom clean interior spaces and render surfaces dust-free before painting or finishing.
- C. The Contractor shall remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning. The Contractor shall schedule the cleaning and painting so that

dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

- D. The Contractor shall provide drop cloths or other suitable protection to avoid paint spatters on adjacent work areas.
- E. Storage tanks and their associated accessories, and saddle surfaces shall be cleaned and prepared for primer or paint in accordance with Surface Specifications No. 1 (SP1) of the Steel Structures Painting Council (SSPC).

### 3.04 APPLICATION

- A. The Contractor shall apply each coat of primer and paint evenly, free of brush marks, and other defects.
- B. The Contractor shall allow each coat to thoroughly dry before applying succeeding coats. Where 2 or more coats are to be applied, the Contractor shall use a different shade for each coat.
- C. The Contractor shall apply each coat in accordance with the material manufacturer's painted coating rate, but in no case less than 5 mil dry film thickness for 3-coat work and 3.5 mil dry film thickness for 2-coat work.
- D. The Contractor shall apply a coat of primer or undercoat on all surfaces specified to be finish painted, unless otherwise specified.
- E. Ferrous Materials – 1 coat of bonding undercoat, 1 coat of alkyd primer, and 2 more final coats of alkyd paint.
- F. Stainless Steel – No painting required.
- G. Fiberglass – No painting required.
- H. Galvanized Metal Copper and Aluminum – 1 coat of bonding undercoat (galvanized surfaces only), 1 coat of alkyd primer undercoat, and 2 coats of exterior alkyd gloss paint.
- I. Underground Petroleum Storage tank accessories – This includes exposed surfaces of hold down straps, turnbuckles, adjustment rods, galvanized wire rope, wire rope clamps, eye bolts and anchor rods - 1 coat of bonding undercoat (galvanized surface only), and 1 heavy coat of coal tar epoxy.

### 3.05 FINAL COAT COLOR

- A. Ferrous Material – The final coats shall be as follows: 1 coat of bonding undercoat, 1 coat of alkyd primer, and 2 or more final coats of alkyd paint. Top coat as indicated.
  - 1. Pipe Bollards - safety yellow
  - 2. Aboveground steel tanks and dikes - black

3. Structural Steel Supports for Fuel Pump Island/Dry Chemical Fire Extinguishing System - as directed by the Construction Manager.
  4. Fuel Pump Island Stainless Steel Fascia – no paint.
  5. Containment Chamber Manhole Frames and Lids - as directed.
  6. Steel Vent Piping including vent caps (above ground): Exposed Exterior to a Building - black. Exposed gasoline and diesel fuels piping - black.
- B. Galvanized Metal Copper and Aluminum Surfaces – The final costs shall be as follows:
1. Galvanized steel piping and exposed conduit (Aboveground not in containment chamber and not in contact with diesel fuel) - black. Exposed conduit mounted on walls or ceilings may be painted any color to match color of walls or ceiling.
  2. Galvanized surfaces: Exposed raceways fittings, pull boxes, junction boxes, etc., installed in finished spaces - as directed.
  3. Painted or primed surfaces: Exposed raceways, fittings, pull boxes, junction boxes, etc., installed in finished spaces: 2 coats of latex semi-gloss enamel color - as directed.

END OF SECTION

**SECTION 104416**

**FIRE EXTINGUISHERS**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

The Contractor shall furnish all labor, materials, tools, and equipment, and install fire extinguishers on the diesel fueling islands, as required by the Contract Documents.

**1.02 SUBMITTALS**

The following items shall be submitted to the Construction Manager for approval in accordance with the SECTION: SUBMITTALS.

- A. Equipment list including size, type, and materials of construction
- B. Manufacturer's descriptive and technical literature, including catalog cuts
- C. Legends and sizes of name plates
- D. Equipment certifications and test reports

**PART 2 - PRODUCTS**

**2.01 PORTABLE FIRE EXTINGUISHERS:**

- A. The 20-pound dry chemical fire extinguishers shall be Model TGP20G as manufactured by General Fire Extinguishers Co., or approved equal. The extinguishers shall be portable and of the steel cylinder type with squeeze-grip, pressure-seat valve and shall have a rated discharge capacity of 20 pounds. The extinguishers and all their assembled parts shall be approved by the Underwriters' Laboratories and a label reading "Underwriters' Laboratories, Inc. Inspected (Type) Extinguisher - Classification (Rating)" shall form a part of the name plate.
- B. Each extinguisher shall be provided with a tag and approved type card holder. Provision shall be made on the tag for inserting the following information:
  - 1. Date of reweighing
  - 2. Result of reweighing
  - 3. Signature(s) of person(s) who performed reweighing
- C. Extinguishers shall be so designed and constructed that the maximum leakage in any one year shall not exceed 5% of the original gas content.
- D. All surfaces of the extinguishers tank, except for plated surfaces, shall be factory-painted with red enamel in accordance with OSHA standards. All exposed gas valve surfaces shall be chrome or nickel plated.

- E. In addition to the Underwriters' Laboratories label appearing on each extinguisher, a manufacturer's name plate shall be provided and shall be embossed or etched to bear the manufacturer's name and full directions for the proper operation of the extinguisher.
- F. A long rectangular sign stating: "FIRE EXTINGUISHER", shall be placed in the immediate vicinity of each of the extinguisher.

**2.02 STORAGE CABINETS**

The Contractor shall furnish and install a cabinet for each 20-pound fire extinguisher as specified herein. The fire extinguisher cabinets shall be constructed entirely of 304 stainless-steel with a No. 4 finish. The cabinets shall have a stainless-steel door and trim and shall be suitable for surface mounting. The cabinets shall be of the break glass type, lock style.

**PART 3 - EXECUTION**  
**(Not Used)**

**END OF SECTION**

**SECTION 220500**  
**COMMON WORK RESULTS FOR PLUMBING**

**PART 1 – GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SUMMARY**

- A. This Section includes the following:
  - 1. Piping materials and installation instructions common to most piping systems.
  - 2. Transition fittings.
  - 3. Dielectric fittings.
  - 4. Sleeves.
  - 5. Escutcheons.
  - 6. Grout.
  - 7. Equipment installation requirements common to equipment sections.
  - 8. Painting and finishing.
  - 9. Supports and anchorages.

**1.03 DEFINITIONS**

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but

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subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

**F. The following are industry abbreviations for plastic materials:**

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. CPVC: Chlorinated polyvinyl chloride plastic.
3. PE: Polyethylene plastic.
4. PVC: Polyvinyl chloride plastic.

**G. The following are industry abbreviations for rubber materials:**

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

### **1.04 SUBMITTALS**

**A. Product Data: For the following:**

1. Transition fittings.
2. Dielectric fittings.
3. Escutcheon.

**B. Welding certificates.**

### **1.05 QUALITY ASSURANCE**

**A. Steel Support Welding:** Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

**B. Steel Pipe Welding:** Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests or welding processes involved and that certification is current.

**C. Electrical Characteristics for Plumbing Equipment:** Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.



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### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

### **1.07 COORDINATION**

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

### **2.02 PIPE, TUBE, AND FITTINGS**

- A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

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### **2.03 JOINING MATERIALS**

- A. Refer to individual Division 22 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
    - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
  - 2. AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

### **2.04 TRANSITION FITTINGS**

- A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
  - 1. Available Manufacturers:
    - a. Cascade Waterworks Mfg. Co.
    - b. Dresser Industries, Inc.; DMD Div.
    - c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
    - d. JCM Industries.
    - f. Smith-Blair, Inc.
    - j. Viking Johnson.

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2. Underground Piping NPS 1-1/2 (DN 40) and Smaller: Manufactured fitting or coupling.
  3. Underground Piping NPS 2 (DN 50) and Larger: AWWA C219, metal sleeve-type coupling.
  4. Aboveground Pressure Piping: Pipe fitting.
- B. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.
1. Available Manufacturers:
    - a. Cascade Waterworks Mfg. Co.
    - b. Fernco, Inc.
    - c. Mission Rubber Company.

### 2.05 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C).
1. Available Manufacturers:
    - a. Capitol Manufacturing Co.
    - b. Central Plastics Company.
    - c. Eclipse, Inc.
    - d. Epco Sales, Inc.
    - e. Hart Industries, International, Inc.
    - f. Watts Industries, Inc.; Water Products Div. g. Zurn Industries, Inc.; Wilkins Div.
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300- psig (1035- or 2070-kPa) minimum working pressure as required to suit system pressures.
1. Available Manufacturers:
    - a. Capitol Manufacturing Co.
    - b. Central Plastics Company.
    - c. Epco Sales, Inc.

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- d. Watts Industries, Inc.; Water Products Div.
- E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
  - 1. Available Manufacturers:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Central Plastics Company.
    - d. Pipeline Seal and Insulator, Inc.
  - 2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig (1035- or 2070-kPa) minimum working pressure where required to suit system pressures.
- F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).
  - 1. Available Manufacturers:
    - a. Calpico, Inc.
    - b. Lochinvar Corp.
- G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).
  - 1. Available Manufacturers:
    - a. Perfection Corp.
    - b. Precision Plumbing Products, Inc.
    - c. Sioux Chief Manufacturing Co., Inc.
    - d. Victaulic Co. of America.

### 2.06 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron

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pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

- 1. Underdeck Clamp: Clamping ring with set screws.

### **2.07 ESCUTCHEONS**

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
  - 1. Finish: Polished chrome-plated and rough brass.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
  - 1. Finish: Polished chrome-plated and rough brass. E. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- E. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

### **2.08 GROUT**

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
  - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
  - 3. Packaging: Premixed and factory packaged.

**PART 3 - EXECUTION**

**3.01 PIPING SYSTEMS - COMMON REQUIREMENTS**

- A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing. G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections. J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
  - 1. New Piping:
    - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep- pattern type.
    - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
    - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
    - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    - e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or split- casting, cast-brass type with polished chrome-plated finish.
    - f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish.
    - g. Bare Piping in Equipment Rooms: One-piece, cast-brass type.

- h. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
- M. Sleeves are not required for core-drilled holes.
- N. Permanent sleeves are not required for holes formed by removable PE sleeves.
- O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
- P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
  - 3. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a. Steel Pipe Sleeves: For pipes smaller than NPS 6 (DN 150).
    - b. Steel Sheet Sleeves: For pipes NPS 6 (DN 150) and larger, penetrating gypsum-board partitions.
    - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
      - 1) Seal space outside of sleeve fittings with grout.
  - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.
- Q. Underground, Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing sealant.

- R. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.
- S. Verify final equipment locations for roughing-in.
- T. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

### 3.02 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus Brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type,



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and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

### **3.03 PIPING CONNECTIONS**

- A. Make connections according to the following, unless otherwise indicated:
  - 1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
  - 2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
  - 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

### **3.04 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS**

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

### **3.05 PAINTING**

- A. Painting of plumbing systems, equipment, and components is specified in Division 09 Section "Painting and Finishing".
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

### **3.06 ERECTION OF METAL SUPPORTS AND ANCHORAGES**

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- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

### **3.07 ERECTION OF WOOD SUPPORTS AND ANCHORAGES**

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

### **3.08 GROUTING**

- A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

**END OF SECTION**

**SECTION 220529**

**HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT**

**PART 1 – GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SUMMARY**

- A. This Section includes the following hangers and supports for plumbing system piping and equipment:
  - 1. Steel pipe hangers and supports.
  - 2. Trapeze pipe hangers.
  - 3. Metal framing systems.
  - 4. Thermal-hanger shield inserts.
  - 5. Fastener systems.
  - 6. Pipe stands.
  - 7. Pipe positioning systems.
  - 8. Equipment supports.

**1.03 DEFINITIONS**

- A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

**1.04 PERFORMANCE REQUIREMENTS**

- A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

**1.05 SUBMITTALS**

- A. Product Data: For the following:

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1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.
3. Pipe positioning systems.

B. Welding certificates.

### **1.06 QUALITY ASSURANCE**

- A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

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

### **2.02 STEEL PIPE HANGERS AND SUPPORTS**

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers:

1. AAA Technology & Specialties Co., Inc.
2. Bergen-Power Pipe Supports.
3. B-Line Systems, Inc.; a division of Cooper Industries.
4. Carpenter & Paterson, Inc.
5. Empire Industries, Inc.
6. ERICO/Michigan Hanger Co.
7. Globe Pipe Hanger Products, Inc.
8. Grinnell Corp.
9. GS Metals Corp.
10. National Pipe Hanger Corporation.
11. PHD Manufacturing, Inc.
12. PHS Industries, Inc.
13. Piping Technology & Products, Inc.
14. Tolco Inc.

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- C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

### **2.03 TRAPEZE PIPE HANGERS**

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U- bolts.

### **2.04 METAL FRAMING SYSTEMS**

- A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.
- B. Manufacturers:
  - 1. B-Line Systems, Inc.; a division of Cooper Industries.
  - 2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
  - 3. GS Metals Corp.
  - 4. Power-Strut Div.; Tyco International, Ltd.
  - 5. Thomas & Betts Corporation.
  - 6. Tolco Inc.
  - 7. Unistrut Corp.; Tyco International, Ltd.
- C. Coatings: Manufacturer's standard finish unless bare metal surfaces are indicated. D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

### **2.05 THERMAL-HANGER SHIELD INSERTS**

- A. Description: 100-psig- (690-kPa-) minimum, compressive-strength insulation insert encased in sheet metal shield.
- B. Manufacturers:
  - 1. Carpenter & Paterson, Inc.
  - 2. ERICO/Michigan Hanger Co.
  - 3. PHS Industries, Inc.
  - 4. Pipe Shields, Inc.
  - 5. Rilco Manufacturing Company, Inc.
  - 6. Value Engineered Products, Inc.
- C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier.

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- D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.
- E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- G. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

### **2.06 PIPE POSITIONING SYSTEMS**

- A. Description: IAPMO PS 42, system of metal brackets, clips, and straps for positioning piping in pipe spaces for plumbing fixtures for commercial applications.
- B. Manufacturers:
  - 1. C & S Mfg. Corp.
  - 2. HOLDRITE Corp.; Hubbard Enterprises.
  - 3. Samco Stamping, Inc.

### **2.07 EQUIPMENT SUPPORTS**

- A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

### **2.08 MISCELLANEOUS MATERIALS**

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
  - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
  - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

## **PART 3 - EXECUTION**

### **3.01 HANGER AND SUPPORT APPLICATIONS**

- A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment. Support horizontal piping in accordance with the following schedule:

1. All horizontal steel and copper pipe shall be supported at maximum intervals as follows:

Steel pipe - up to 1-1/4" - 8'-0"; 1-1/2" to 2-1/2" - 10'-0"; 3" and larger - 12'-0". Copper tube and Brass Pipe - up to 1-1/4" - 6'-0"; 1-1/2" to 2-1/2" - 8'-0"; 3" and larger - 10'-0".

- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use padded hangers for piping that is subject to scratching.
- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
  2. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
  3. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
  4. Adjustable, Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36 (DN 65 to DN 900), if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
- G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500).
- H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
  2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C)

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- piping installations.
3. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
  4. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.
- I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
  2. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
  3. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
  4. C-Clamps (MSS Type 23): With retaining clip for structural shapes.
  5. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
  6. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
  7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    - a. Light (MSS Type 31): 750 lb (340 kg).
- J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
  2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
  3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- K. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
- L. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.
- M. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.
- 3.02 HANGER AND SUPPORT INSTALLATION
- A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure. Intervals of hanger supports shall be in accordance with the latest NYC Building Code.



- B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
  - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
  - 2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
- D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- E. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. Refer to Division 22 Section "Plumbing Fixtures" for plumbing fixtures.
- F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping.
- K. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.
- M. Insulated Piping: Comply with the following:
  - 1. Attach clamps and spacers to piping.
    - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.

- c. Do not exceed pipe stress limits according to ASME B31.9 for building services piping.
- 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
  - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
- 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
  - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
- 4. Shield Dimensions for Pipe: Not less than the following:
  - a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
- 5. Insert Material: Length at least as long as protective shield.
- 6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

### **3.03 EQUIPMENT SUPPORTS**

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make smooth bearing surface.
- C. Provide lateral bracing, to prevent swaying, for equipment supports. D. For grease interceptor, provide supports as indicated on drawing.

### **3.04 METAL FABRICATIONS**

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding,

appearance and quality of welds, and methods used in correcting welding work, and 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. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

### **3.05 ADJUSTING**

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).

**END OF SECTION**

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**SECTION 220553**

**IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT**

**PART 1 – GENERAL**

**1.01 RELATED DOCUMENTS**

Drawings and general provisions of the Contract, Including Supplementary Conditions and Division 01 Specification Sections, Section.

**1.02 SUMMARY**

**A. Section Includes:**

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Stencils.
5. Valve tags.

**1.03 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- C. Valve numbering scheme.
- D. Valve Schedules: For each piping system to include in maintenance manuals.

**1.04 COORDINATION**

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

## **PART 2 - PRODUCTS**

### **2.01 EQUIPMENT LABELS**

#### **A. Metal Labels for Equipment:**

1. **Material and Thickness:** Aluminum, 0.032-inch (0.8-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. **Minimum Label Size:** Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
3. **Minimum Letter Size:** 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. **Fasteners:** Stainless-steel rivets or self-tapping screws.
5. **Adhesive:** Contact-type permanent adhesive, compatible with label and with substrate.

#### **B. Label Content:** Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

#### **C. Equipment Label Schedule:** For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

### **2.02 PIPE LABELS**

#### **A. General Requirements for Manufactured Pipe Labels:** Preprinted, color-coded, with lettering indicating service, and showing flow direction.

#### **B. Pretensioned Pipe Labels:** Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

#### **C. Self-Adhesive Pipe Labels:** Printed plastic with contact-type, permanent-adhesive backing.

#### **D. Pipe Label Contents:** Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. **Flow-Direction Arrows:** Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. **Lettering Size:** At least 1-1/2 inches (38 mm) high.

## 2.03 STENCILS

- A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; and minimum letter height of 3/4 inch (19 mm) for access panel and door labels, equipment labels, and similar operational instructions.
  - 1. Stencil Paint: Exterior, gloss, alkyd enamel or acrylic enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
  - 2. Identification Paint: Exterior, alkyd enamel or acrylic enamel in colors according to ASME A13.1 unless otherwise indicated.

## 2.04 SIGNS

- A. Material: Multilayer, multicolor, plastic for mechanical engraving, and having predrilled holes for attachment hardware or vinyl self adhesive type.
- B. Letter Color: Black.
- C. Background Color: White.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
- E. Size: 14 inch wide by 10 inch high.
- F. Minimum Letter Size: 1/2 inch (13 mm). Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Content: As indicated on drawing.

## 2.05 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping system abbreviation and 1/2-inch (13-mm) numbers.
  - 1. Tag Material: Brass, 0.032-inch (0.8-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
  - 2. Fasteners: Brass wire-link or beaded chain; or S-hook.
- B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch (A4) bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or

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modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

### **PART 3 - EXECUTION**

#### **3.01 PREPARATION**

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

#### **3.02 EQUIPMENT LABEL INSTALLATION**

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

#### **3.03 PIPE LABEL INSTALLATION**

- A. Piping Color-Coding: Painting of piping is specified in Division 09.
- B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels complying with ASME A13.1, on each piping system.
  1. Identification Paint: Use for contrasting background.
  2. Stencil Paint: Use for pipe marking.
- C. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
  1. Near each valve and control device.
  2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
  3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
  4. At access doors, manholes, and similar access points that permit view of concealed piping.
  5. Near major equipment items and other points of origination and termination.



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6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

### 3.04 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Provide a sign attached (with wire or other approved method) to the piping or hanger near each valve, indicating what the valve controls. Include at least the following information: service (ie. hot or cold water), riser type (ie. kitchen, bathroom, etc.), and apartment line. Signs shall be 2 inch X 6 inch size made of "Setonply" with engraved white letters on green background (or other standard color combination selected by the Authority). Sign shall be Seton style "EB26" or equal
- C. Valve-Tag Application Schedule: Tag valves according to size and shape and with captions similar to those indicated in the following subparagraphs:
  1. Valve-Tag Size and Shape:
    - a. Cold Water: 1-1/2 inches (38 mm), round
    - b. Hot Water: 1-1/2 inches (38 mm), round
    - c. Natural Gas: 1-1/2 inches (38 mm), round

END OF SECTION

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**SECTION 221413**

**FACILITY STORM DRAINAGE PIPING**

**PART 1 – GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SUMMARY**

- A. This Section includes the following storm drainage piping inside the building:
  - 1. Pipe, tube, and fittings.
  - 2. Special pipe fittings.

**1.03 DEFINITIONS**

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. LLDPE: Linear, low-density polyethylene plastic.
- C. PE: Polyethylene plastic.
- D. PVC: Polyvinyl chloride plastic.
- E. TPE: Thermoplastic elastomer.

**1.04 PERFORMANCE REQUIREMENTS**

- A. Components and installation shall be capable of withstanding the following minimum working-pressure, unless otherwise indicated:
  - 1. Storm Drainage Piping: 10-foot head of water (30 kPa).

**1.05 SUBMITTALS**

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Field quality-control inspection and test reports.

**1.06 QUALITY ASSURANCE**

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURERS**

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

- 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

**2.02 PIPING MATERIALS**

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

**2.03 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS**

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.
  - 1. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.
    - a. Available Manufacturers:
      - 1) ANACO.
      - 2) Clamp-All Corp.
      - 3) Ideal Div.; Stant Corp.
      - 4) Husky
      - 5) Mission Rubber Co.
      - 6) Tyler Pipe; Soil Pipe Div.
  - 2. Heavy-Duty, Shielded, Cast-Iron Couplings: ASTM A 48/A 48M, two-piece, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve.
    - a. Available Manufacturers:

- 1) MG Piping Products Co.

### **PART 3 - EXECUTION**

#### **3.01 EXCAVATION**

- A. Refer to Division 31 Section "Earth Work" for excavating, trenching, and backfilling.

#### **3.02 PIPING APPLICATIONS**

- A. Aboveground storm drainage piping NPS 6 (DN 150) and smaller shall be any of the following:
  1. Hubless cast-iron soil pipe and fittings; heavy-duty shielded, stainless-steel couplings; and coupled joints.
- B. Underground storm drainage piping NPS 6 (DN 150) and smaller shall be the following:
  1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
- C. Underground, storm drainage piping NPS 8 (DN 200) and larger shall be the following:
  1. Extra heavy, cast-iron soil pipe and fittings; gaskets; and gasketed joints.

#### **3.03 PIPING INSTALLATION**

- A. Not Used
- B. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing."
- C. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- D. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- E. Lay buried building storm drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other

installation requirements. Maintain swab in piping and pull past each joint as completed.

- F. Install storm drainage piping at the following minimum slopes, unless otherwise indicated:
  - 1. Building Storm Drain: 1 percent downward in direction of flow.
  - 2. Horizontal Storm-Drainage Piping: 2 percent downward in direction of flow.
- G. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- H. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

### 3.04 JOINT CONSTRUCTION

- A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Hubless Cast-Iron Soil Piping Coupled Joints: Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

### 3.05 HANGER AND SUPPORT INSTALLATION

- A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:
  - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
  - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
    - a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
  - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
- B. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.

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- E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 3 (DN 80): 60 inches (1500 mm) with 1/2-inch (13-mm) rod.
  - 2. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches (1500 mm) with 5/8-inch (16-mm) rod.
  - 3. NPS 6 and NPS 8 (DN 150 and DN 200): 60 inches (1500 mm) with 3/4-inch (19-mm) rod.
  - 4. Behind every hub connection.
- F. Install supports for vertical cast-iron soil piping every 15 feet (4.5 m).
- G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### 3.06 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect storm drainage piping to roof drains and storm drainage specialties.

### 3.07 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
  - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
  - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
  2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  3. Test Procedure: Test storm drainage piping on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
  4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
  5. Prepare reports for tests and required corrective action.
- E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  2. Cap and subject piping to static-water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
  3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
  4. Prepare reports for tests and required corrective action.

### 3.08 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION



**SECTION 221423**

**FACILITY STORM DRAINAGE PIPING SPECIALTIES**

**PART 1 – GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SUMMARY**

- A. This Section includes the following storm drainage piping specialties:
  - 1. Cleanouts
  - 2. Roof Drains
- B. Related Sections include the following:
  - 1. Division 22 Section "Facility Storm Drainage Piping" for storm water piping.

**1.03 SUBMITTALS**

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

**1.04 QUALITY ASSURANCE**

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

**1.05 COORDINATION**

- A. Coordinate size and location of roof penetrations.

**PART 2 - PRODUCTS**

**2.01 CLEANOUTS**

- A. Exposed Cast-Iron Cleanouts:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Josam Company; Josam Div.
    - b. MIFAB, Inc.

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- c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
  - d. Tyler Pipe; Wade Div.
  - e. Watts Drainage Products Inc.
  - f. Zurn Plumbing Products Group; Specification Drainage Operation.
- 2. Standard: ASME A112.36.2M for cast iron.
  - 3. Size: Same as connected drainage piping
  - 4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
  - 5. Closure: Countersunk or raised-head, brass plug.
  - 6. Closure Plug Size: Same as cleanout size.

### **2.02 ROOF DRAINS**

#### **A. Gutter Drains (GD):**

- 1. Basis-of-Design Product: Subject to compliance with requirements, provide gutter drains J.R.Smith Model DX 1010-C-R-CID or a comparable product by one of the following:
  - a. Josam Company; Josam Div.
  - b. MIFAB, Inc.
  - c. Tyler Pipe; Wade Div.
  - d. Watts Drainage Products Inc.
  - e. Zurn Plumbing Products Group; Light Commercial Operation.
  - f. Zurn Plumbing Products Group; Specification Drainage Operation.
- 2. Standard: ASME A112.21.2M.
- 3. Pattern: Roof drain.
- 4. Body Material: Cast iron.
- 5. Dimensions of Body: Wide flange body.
- 6. Combination Flashing Ring and Gravel Stop.
- 7. Flow-Control Weirs: Not required
- 8. Outlet: Bottom.
- 9. Dome Material: Cast iron.
- 10. Extension Collars: Not Required.
- 11. Underdeck Clamp: Required.
- 12. Sump Receiver: Required.

#### **B. Cast-Iron Emergency Gutter Drains (EGD):**

- 1. Basis-of-Design Product: Subject to compliance with requirements, provide gutter drains J.R.Smith Model DX-1070-C-R-CID-WD03 or a comparable product by one of the following:
  - a. Josam Company; Josam Div.
  - b. MIFAB, Inc.

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- c. Tyler Pipe; Wade Div.
  - d. Watts Drainage Products Inc.
  - e. Zurn Plumbing Products Group; Light Commercial Operation.
  - f. Zurn Plumbing Products Group; Specification Drainage Operation.
- 
- 2. Standard: ASME A112.21.2M.
  - 3. Pattern: Roof drain.
  - 4. Body Material: Cast iron.
  - 5. Dimensions of Body: Wide flange body.
  - 6. Combination Flashing Ring and Gravel Stop.
  - 7. Flow-Control Weirs: Not required.
  - 8. Solid Water Dam: 3" Solid Water Dam.
  - 9. Outlet: Bottom.
  - 10. Dome Material: Cast iron.
  - 11. Extension Collars: Required.
  - 12. Underdeck Clamp: Required.
  - 13. Sump Receiver: Required.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION**

- A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.
- B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
  - 1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
  - 2. Locate at each change in direction of piping greater than 45 degrees.
  - 3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
  - 4. Locate at base of each vertical stack.
- C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- E. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

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**3.02 CONNECTIONS**

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

**3.03 PROTECTION**

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

**END OF SECTION**

**SECTION 230500**

**COMMON WORK RESULTS FOR HVAC**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes the following:
  - 1. Wall Sleeves.
  - 2. Equipment installation requirements common to equipment sections.
  - 3. Supports and anchorages.

**1.2 DEFINITIONS**

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

**1.3 SUBMITTALS**

- A. Welding certificates.

**1.4 QUALITY ASSURANCE**

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

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- B. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

### **PART 2 - PRODUCTS**

#### **2.1 SLEEVES**

- A. Manufacturer furnished with equipment.

### **PART 3 - EXECUTION**

#### **3.1 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS**

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

#### **3.2 ERECTION OF METAL SUPPORTS AND ANCHORAGES**

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

**END OF SECTION**

**SECTION 230529**

**HANGERS & SUPPORTS HVAC EQUIPMENT**

**PART 1 - GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section

**1.02 SUMMARY**

- A. This Section includes the following hangers and supports for HVAC system piping and equipment:
1. Metal framing systems.
  2. Fastener systems.
  3. Equipment supports.
- B. Related Sections include the following:
1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for equipment supports.
  2. Not used
  3. Supports and anchors furnished as part of factory-fabricated equipment, are specified as part of equipment assembly in other Division 23 sections.

**1.03 PERFORMANCE REQUIREMENTS**

- A. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

**1.04 QUALITY ASSURANCE**

- A. Materials and work shall conform to the latest edition of reference specifications and industry standards listed below and specified herein and to applicable codes and requirements of local authorities having jurisdiction, whichever is more stringent.
1. Code Compliance: Comply with applicable plumbing codes pertaining to product materials and installation of supports and anchors.
  2. UL and FM Compliance: Provide products which are UL listed and FM approved.
  3. MSS Standard Compliance
    - a. Provide pipe hangers and supports of which materials, design, and manufacture comply with MSS SP-58.

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- b. Select and apply pipe hangers and supports complying with MSS SP-69.
- c. Fabricate and install pipe hangers and supports complying with MSS SP-89.
- d. Terminology used in this section is defined in MSS SP-90.

### **1.05 SUBMITTALS**

- A. Product Data
  - 1. Hangers and supports
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
  - 1. Duct hangers. Include Product Data for components.
  - 2. Metal framing systems. Include Product Data for components.
  - 3. Equipment supports.
- C. Welding Certificates
  - 1. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code--Sheet Steel."
  - 2. Welding: Qualify procedures and personnel according to the following:
    - a. AWS D1.3, "Structural Welding Code--Sheet Steel."

## **PART 2- PRODUCTS**

### **2.01 MATERIALS**

- A. Building Attachments
  - 1. Except as otherwise indicated, provide factory-fabricated building attachments complying with MSS SP-58, of one of the following MSS types listed to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods.
  - 2. Side Beam or Channel Clamps: MSS Type 20.
  - 3. Welded Beam Attachments: MSS Type 22.
  - 4. C-Clamps: MSS Type 23.
  - 5. Side Beam Clamps: MSS Type 27.
  - 6. Steel Beam Clamps W/Eye Nut: MSS Type 28.
  - 7. Malleable Beam Clamp with Extension Piece: MSS Type 30.
  - 8. Steel Brackets: One of the following for indicated loading:



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- a. Light Duty: MSS Type 31.
  - b. Medium Duty: MSS Type 32.
  - c. Heavy Duty: MSS Type 33.
- B. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
1. Manufacturers:
    - a. Hilti, Inc.
    - b. ITW Ramset/Red Head.
    - c. Masterset Fastening Systems, Inc.
    - d. MKT Fastening, LLC.
    - e. Powers Fasteners.
    - f. Approved Equal.
- C. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
1. Manufacturers:
    - a. B-Line Systems, Inc.; a division of Cooper Industries.
    - b. Empire Industries, Inc.
    - c. Hilti, Inc.
    - d. ITW Ramset/Red Head.
    - e. MKT Fastening, LLC.
    - f. Powers Fasteners.
    - g. Approved Equal.
- D. Chemical Fasteners: Insert-type-stud, bonding-system anchor for use with hardened Portland cement concrete, with tension and shear capacities appropriate for application.
- a. Bonding Material: ASTM C 881/C 881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
  - b. Stud: ASTM A 307, zinc-coated carbon steel with continuous thread on stud unless otherwise indicated.

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- c. Washer and Nut: Zinc-coated steel.

### **E. Equipment Supports**

- a. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

### **F. Miscellaneous Materials**

- a. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- b. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.
  - 1) Properties: Non-staining, non-corrosive, and nongaseous.
  - 2) Design Mix: 5000-psi, 28-day compressive strength.

## **PART 3- EXECUTION**

### **3.01 EXAMINATION**

- A. Examine conditions at the job site where work of this section is to be performed to insure proper arrangement and fit of the work. Start of work implies acceptance of job site conditions.

### **3.02 PREPARATION**

- A. Examine the Contract Drawings and specifications in order to insure the completeness of the work required under this Section. Provide supplementary parts necessary to complete work, though not specifically indicated on Drawings or specified herein.
- B. Verify measurements and dimensions at the jobsite and cooperate in the coordination and scheduling of the work of this Section with the work of related trades, so as not to delay job progress.
- C. Prior to installation of hangers, supports, anchors and associated work, Contractor shall meet at project site with installer of each component of associated work, inspection and testing agency representatives (if any), installers of other work requiring coordination with work of this section and Architect for purpose of reviewing material selections and procedures to be followed in performing the work in compliance with requirements specified.

## **HARPER STREET YARD**

FMS ID# HWQF027C

### **3.03 METAL FABRICATIONS**

- A. Cut, drill, and fit miscellaneous metal fabrications for equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and 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. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

### **3.04 PAINTING**

- A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 Painting Sections. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

### **3.05 ADJUSTING AND CLEANING**

- A. Support Adjustment: Provide grout under supports so as to bring equipment to proper level and elevations.
- B. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touchup paint.

**END OF SECTION**

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**SECTION 231100**

**UNDERGROUND DIESEL FUEL SYSTEM**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

The Contractor shall furnish all labor, material, tools, and equipment and install the underground diesel fuel system, as required by the Contract Documents.

**1.02 SUBMITTALS**

The following items shall be submitted to the Construction Manager for review and approval in accordance with SECTION: SUBMITTALS.

- A. Shop drawings, showing proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of work including clearances for maintenance and operation.
- B. Manufacturer's descriptive, technical literature, and catalog cuts, including installation instructions.
- C. Any certifications and the results of any testing performed to demonstrate that the work and equipment complies with the Contract Specifications.
- D. Contractor shall provide three (3) O&M manuals in 3-ring vinyl binders incorporating all manufacturers' information describing operations and maintenance schedules for the system installed. O&M manuals shall include wiring diagrams, detailed equipment list and spare parts required at standard intervals.

**1.03 QUALITY ASSURANCE**

- A. The contractor or subcontractor performing the work of this section must, within the last five (5) consecutive years prior to the bid opening, have successfully completed in a timely fashion at least three (3) projects similar in scope and type to the required work. In addition, for tank work, the contractor or subcontractor must be licensed or approved by the manufacturer of the tank system.
- B. The Contractor shall purchase the diesel fuel systems from a manufacturer approved by the Construction Manager, the New York City Fire Department, and the New York City Department of Buildings. The manufacturer shall maintain a service depot within the City with parts and service personnel available for servicing of parts at any time. The manufacturer shall furnish required supervision for the installation of the systems, and shall furnish an experienced installation and maintenance worker for the supervision of personnel in the initial operation and maintenance of the systems.

- C. The Contractor shall install compatible components and shall perform all modifications necessary for the proper operation and guarantee of the equipment. The Construction Manager reserves the right to require the Contractor to make such tests, during the installation and upon the completion thereof, as may be necessary to demonstrate that the work and equipment, as installed, complies with the Contract Specifications and requirements provided herein. The Contractor shall provide all labor, instruments, and apparatus required for such tests. If any of the work or equipment fails to meet the Contract Requirements or to function properly, the defects shall be rectified at the Contractor's own expense by readjusting, or by removing and replacing the faulty work or equipment until, under test, the requirements are met. The Construction Manager reserves the right to check the Contractor's instruments or to furnish his own instruments.

#### 1.04 ALTERATIONS TO ACCOMMODATE EQUIPMENT

The Contract Drawings indicate a typical installation based on a certain make or brand of equipment, and are not to be construed as representing the layout for any other make or brand. Any alterations that are necessary to adequately and satisfactorily accommodate the equipment to be installed under this Contract shall be made by the Contractor at his own expense, in accordance with the Contract Documents and subject to approval by the Construction Manager.

#### 1.05 APPLICABLE STANDARDS

All work performed under this Section shall comply with the following standards and all other applicable federal, state, and local standards including revisions to the date of Contract.

ASME	American Society of Mechanical Engineers
NFPA	National Fire Protection Association
UL	Underwriters' Laboratories
NEC	National Electrical Code
NYCEC	The New York City Electrical Code
ANSI	American National Standards Institute
IEEE	Institute of Electrical and Electronic Engineers
	The Board of Standards and Appeals of the City of New York
	The Building Code of the City of New York
	New York City Fire Law Handbook
API	American Petroleum Institute

### PART 2 - PRODUCTS

#### 2.01 UNDERGROUND DIESEL FUEL STORAGE TANK

- A. The underground diesel fuel storage tanks shall be provided where required by the Contract Drawings. The Contract Drawings show the type, number, size, and location of the underground diesel fuel storage tanks. The underground storage tanks shall be equipped with dry interstitial space.
- B. The underground storage tank shall be constructed of double-walled, fiberglass reinforced plastic (FRP) with a space between the primary and secondary shell walls to allow for the free flow and containment of all leaked products from the primary tank. This space shall

also allow for the insertion of an interstitial monitoring device as specified in SECTION: INSTRUMENTATION AND CONTROLS. The tank and the tank manufacturer shall be approved by the New York City Fire Department for underground installation in New York City.

C. Hydraulic Pressure: The tank shall have a primary shell suitable for use under a 30 psi hydraulic pressure, and a secondary shell suitable for use under a 10 psi hydraulic pressure. The pressure test shall be performed in accordance with the manufacturer's recommendations and the New York City Fire Department and New York City Building Department regulations.

D. The tank shall include, but not be limited to, the following appurtenances, as shown on Contract Drawings:

1. Manways

Fiberglass manway with a 30 inch manway cover that is compatible with the tank and acceptable to the tank manufacturer. The Contract Drawings show the size, number, and location of manways required for the tank.

2. Sump Collars

54 inch diameter fiberglass turbine sump collar shall be used with external mounting kit around tank manway for installation of containment sump. The fiberglass turbine sump collar shall be compatible with the tank containment sump. The Contract Drawings show the type, number, size, and location of sump collars required for the tank.

3. Fittings

A sufficient number of National Pipe Thread (NPT) fittings shall be supplied in the tank and the manway covers to accommodate all piping and monitoring devices. The Contract Drawings show the size, number, and location of fittings required for the tank and manway cover.

4. Strike Plates

A steel strike plate shall be located in the primary tank beneath the tank opening and shall be a minimum of 12 inches by 12 inches. The strike plates shall be installed by the tank manufacturer and shall be included in the manufacturer's warranty.

5. Anchoring Straps

Tank anchoring straps are required for the installed tank. Straps shall be constructed of material recommended by the tank manufacturer. The size, number, and location of straps shall be as required by the tank manufacturer. Straps shall be used for anchoring tanks to the concrete bottom slab as shown on the Contract Drawings.

- E. Surface Loads: Each tank's primary and secondary shell shall be suitable for use under NYSDOT H-20 live loads.
- F. Compressive load bearing strength: Each tank's primary and secondary shell shall be suitable for use under a minimum of 7 feet of backfill pressure. The safety factor against buckling shall be 3 or greater.

**2.02 CONTAINMENT SUMPS**

**A. Tank Containment Sump:**

1. The containment sump assembly shall be provided over tank manways where required by the Contract Drawings. The Contract Drawings show the type, number, size, and location of sump assemblies required for the tank. The containment sump assemblies shall be manufactured by Fibrelite Corporation of Pawcatuck, CT., or approved equal. Alternative manufacturers include OPW Fuel Management Systems, Inc. and Xerxes Corporation.
2. The containment sump assembly shall be constructed of resin transfer molded composite FRP. The containment sump assembly shall consist of a composite sump and an integrated composite manhole cover and frame over the sump. The manhole cover and frame shall be sealed to the sump but shall not transfer surface loads from the manhole cover and frame to the sump. The sump base shall be constructed with 16 sides to facilitate conduit and piping penetrations.
3. The containment sump assembly shall be watertight, with a watertight sump and an integrated watertight manhole cover and frame. The manhole shall be watertight with an integral seal in the manhole cover to prevent the entry of water when the manhole cover is in the frame. The sump shall include a removable reservoir for collecting water entering when manhole cover is removed in wet conditions.
4. The opening in the sump base, including openings for piping and electrical conduits, shall be provided with entry boots that secure the piping or conduit to the sump base. Each entry boot shall fasten entirely from the inside of the sump, and shall be replaceable entirely from the inside of the sump after the sump is installed in the ground. All entry boot kits shall be third party tested for prolonged exposure to petroleum products. All entry boot kits shall be provided by the sump manufacturer.
5. The containment sump assembly shall include appropriate fittings, adapters, and bonding agents for watertight installation on the sump collar of the fiberglass tank as shown on the Contract Drawings. The containment sump shall be designed for installation on the fiberglass tank in such a way that allows the removal of the tank manway cover without compromising the integrity of the sump assembly.
6. The manhole frame shall be designed so that the manhole cover will fit securely and not spin in the frame. The frame shall incorporate a physical water check



system to prevent the entry of surface water into the sump. This system shall include a single vertical gasket and shall incorporate no penetrations. A locking device shall be provided for each manhole.

7. The manhole cover and frame shall be suitable for use under NYSDOT H-20 live loads. The surface resistivity of each cover shall be less than  $1 \times 10^{-8}$  Ohms to prevent the buildup of static charge.
8. The manhole cover shall include a lifting handle provided by the sump manufacturer. The handle shall be formed with 1/8-inch stainless steel tubing with alloy casting for the key and a plastic grip. The handle shall include a foot lever tool and a locking tool.
9. The containment sump assembly shall be capable of being tested at different stages of installation to verify the integrity of the sump assembly, including all piping and conduit entry boots, the tank manway, and the manhole cover and frame assembly. This testing method shall be designed for verifying sump integrity after sealing to the sump collar and installation of piping and conduit, after placement of backfill, and when tank top slab is installed and installation is complete. The sump manufacturer shall provide a testing method that employs instruments and procedures that yield reproducible results that will ensure that sump assembly installation is watertight. The sump manufacturer shall provide a factory-trained technician to test the sump.

**B. Dispenser Pan**

1. Dispenser pan shall be provided in the fuel dispensing island beneath the dispenser where required by the Contract Drawings. The Contract Drawings show the type, number, size, and location of manhole assemblies required for the dispenser. Each dispenser pan shall be shallow burial, pre-piped, double wall dispenser sump manufactured by Fibrelite Corporation of Pawtuck, CT, or approved equal. Alternative manufacturers include Bravo and Fairfield Maintenance.
2. Dispenser Pan: Each dispenser pan shall be constructed of fiberglass and shall have a built in waterstop at least one inch above the finished surface of the island. Each dispenser pan base section shall be manufactured to fit the 13" island depth. Each dispenser pan shall be sized to be compatible with the dispenser. A steel, adjustable shear valve mounting assembly shall be included in the dispenser pan for each shear valve, and shall be capable of supporting the shear valve so that it functions properly during an impact. Each dispenser pan shall have openings in the side for piping and electrical conduit. Each opening in the dispenser pan shall be provided with watertight entry boots. Each entry boot kit shall be provided by the sump manufacturer.

**2.03 SPILL CONTAINMENT FILL BOX ASSEMBLY**

**A. Spill Containment Fill Box Assembly**

1. Below grade spill containment fill box assemblies shall be provided where required by the Contract Drawings. The Contract Drawings show the type, number, size, and location of spill containment fill box assemblies required for the tank. Each spill containment fill box shall be manufactured of stainless steel by Fibrelite Corporation, Pawcatuk, CT., or approved equal. Alternative manufacturers include OPW Fuel Management Systems, Inc. and Fibercast Systems. The manhole cover, frame, and skirt assembly shall be manufactured by Fibrelite Corporation, Pawcatuk, CT., or approved equal. Alternative manufacturers include Structural Science Composite Company and OPW Fuel Management Systems, Inc.

2. Spill Containment Fill Boxes:

- a. Each below grade spill containment fill box shall be constructed of stainless steel.
- b. Each spill containment fill box shall have a capacity of no less than fifteen (15) gallons for containment of product spilled during the coupling and uncoupling of the fill hose and all related tank-filling operations.
- c. A stainless steel product ID tag shall be provided with each spill containment fill box and inscribed as follows:

Diesel Fuel  
(Actual Capacity of Tank) Gallons  
Tank No. 1, No. 2, etc.  
The ID tag/sign shall be black and white.

3. Spill Containment Fill Box Manhole Covers and Frames:

- a. Cover: Each manhole cover and frame shall be suitable for use under NYSDOT H-20 live loads. Each cover shall be provided with a FRP inscription and shall be color-coded to conform to the American Petroleum Institute Color and Symbol Code. The surface resistivity of each cover shall be less than  $1 \times 10^{-8}$  Ohms to prevent the buildup of static charge.
- b. Frame: Each manhole frame shall incorporate a physical water check system to prevent surface water from entering the manhole. This system shall require no penetrations. A locking device shall be provided for each manhole.
- c. Skirt: Each manhole skirt shall be constructed of fiberglass and colored to match the cover with which it will be used. Each skirt shall extend

within two inches of the manhole cover. Each skirt will be supplied with a stabilizer rod kit for concrete installation. Each rod kit shall be made of stainless steel.

- d. Handle: Each handle shall be formed with 1-1/8-inch stainless steel tubing with alloy casting for the key and a plastic grip. Each handle shall include a locking tool. A handle shall be furnished for each individual manhole cover.

## 2.04 MANHOLE ASSEMBLY

### A. Manhole Assembly (Type I)

1. Type I manhole cover, frame, and skirt assemblies shall be provided in the tank top slab over tank openings where required by the Contract Drawings. The Contract Drawings show the type, number, size, and location of manhole assemblies required for the tank top slab. Each Type I manhole assembly shall be a 36" diameter manhole per sump system with Cover, Frame, and Skirt, as manufactured by Fibrelite Corporation, Pawcatuck, CT, or approved equal. Alternative manufacturers include Structural Science Composite Company and OPW Fuel Management Systems, Inc.

The top of all manhole assemblies shall be raised 1 inch higher than the finished concrete slab. The concrete shall taper to 1 foot away in all directions from the manhole cover.

2. Cover: Each manhole cover and frame shall be suitable for use under NYSDOT H-20 live loads. Each cover shall be provided with a custom ID plate and shall be color-coded to conform to the American Petroleum Institute Color and Symbol Code. The surface resistivity of each cover shall be less than  $1 \times 10^{-8}$  Ohms to prevent the buildup of static charge. A fulcrum lift tool shall be provided for each cover.
3. Frame: Each manhole frame shall incorporate a physical water check system to prevent surface water from entering the manhole. This system shall include no penetrations. A locking device shall be provided for each manhole.
4. Skirt: Each manhole skirt shall be constructed of fiberglass and colored to match the cover with which it will be used. The skirts shall deep burial and extend to within two inches of the manhole cover. Each skirt will be supplied with a stabilizer rod kit for concrete installation. The rod kit shall be made of stainless steel.

### B. Manhole Assembly (Type II)

1. Type II manhole cover, frame, and skirt assemblies shall be provided in the tank top slab over tank openings where required by the Contract Drawings. The Contract Drawings show the type, number, size, and location of manhole assemblies required for each tank top slab. Each Type II manhole assembly

shall be 18" diameter manhole per chamber system as manufactured by Fibrelite Corporation, Pawcatuck, CT, or approved equal. Alternative manufacturers include Structural Science Composite Company and OPW Fuel Management Systems, Inc.

The top of all manhole assemblies shall be raised 1 inch higher than the finished concrete slab. The concrete shall taper to 1 foot away in all directions from the manhole cover.

2. Cover: Each manhole cover and frame shall be suitable for use under NYSDOT H-20 live loads. Each cover shall be provided with a custom ID plate and shall be color-coded to conform to the American Petroleum Institute Color and Symbol Code. The surface resistivity of each cover shall be less than  $1 \times 10^{-8}$  Ohms to prevent the buildup of static charge. A fulcrum lift tool shall be provided for each cover.
3. Frame: Each manhole frame shall incorporate a physical water check system to prevent surface water from entering the manhole. This system shall include no penetrations. A locking device shall be provided for each manhole.
4. Skirt: Each manhole skirt shall be constructed of fiberglass and colored to match the cover with which it will be used. The skirts shall deep burial and extend to within two inches of the manhole cover. Each skirt will be supplied with a stabilizer rod kit for concrete installation. The rod kit shall be made of stainless steel.

**C. Manhole Assembly (Type III)**

1. Type III manhole cover, frame, and skirt assemblies shall be provided in the tank top slab over tank openings where required by the Contract Drawings. The Contract Drawings show the type, number, size, and location of manhole assemblies required for each tank top slab. Each Type III manhole assembly shall be 12" diameter manhole per chamber system as manufactured by Fibrelite Corporation, Pawcatuck, CT, or approved equal. Alternative manufacturers include Structural Science Composite Company and OPW Fuel Management Systems, Inc.

The top of all manhole assemblies shall be raised 1 inch higher than the finished concrete slab. The concrete shall taper to 1 foot away in all directions from the manhole cover.

2. Cover: Each manhole cover and frame shall be suitable for use under NYSDOT H-20 live loads. Each cover shall be provided with a custom ID plate and shall be color-coded to conform to the American Petroleum Institute Color and Symbol Code. The surface resistivity of each cover shall be less than  $1 \times 10^{-8}$  Ohms to prevent the buildup of static charge. A fulcrum lift tool shall be provided for each cover.

3. Frame: Each manhole frame shall incorporate a physical water check system to prevent surface water from entering the manhole. This system shall include no penetrations. A locking device shall be provided for each manhole.
4. Skirt: Each manhole skirt shall be constructed of fiberglass and colored to match the cover with which it will be used. The skirts shall deep burial and extend to within two inches of the manhole cover. Each skirt will be supplied with a stabilizer rod kit for concrete installation. The rod kit shall be made of stainless steel.

## 2.05 FUEL DISPENSER

- A. Fuel dispenser shall be provided where required by the Contract Drawings. The Contract Drawings show the type, number, size and location of the fuel dispenser for the site. The fuel dispenser shall be manufactured by Gasboy International, Inc., of Greensboro, North Carolina, or approved equal. Alternative manufacturers include Wayne and Gilbarco, Inc.
- B. The fuel dispenser system shall be constructed of a heavy-duty meter cabinet with product hose assemblies and nozzle hooks. The fuel dispenser system shall have a minimum pressure rating of 50 psig and shall be suitable for use with the products to be stored in the tank system. Each fuel dispenser shall be UL-listed and approved for use in New York City by the New York City Fire Department. It is very important to DOT operations that the dispenser flow rate is at least the same as currently available at the existing diesel fueling station. Higher flow is desirable.
- C. The fuel dispenser shall have, at a minimum, the following features:
  1. Meter  
  
Four-piston, positive displacement type meter that is factory tested and calibrated for accuracy at any operating speed or pressure.
  2. Solenoid  
  
Normally closed solenoid that opens flow in product lines when pump activates. Standardized 1-inch solenoid valve that may be cleaned or replaced without breaking down pipework.
  3. Register  
  
Electronic display register with power reset interlock that is displayed on both front and back of cabinet. Register shall read in gallons and liters.
  4. Totalizer  
  
Non-resetable totalizer that is displayed on the back of the cabinet. Totalizer shall read in gallons and tenths of gallons, up to 999,999.9 gallons, and then roll over.

5. Pulser

Dual phase with 1,000:1 output ratio with error detection for dedicated use of a card reader fuel management system.

6. Dispenser Cabinet

- a. Each dispenser cabinet shall be constructed of stainless steel.
- b. Each dispenser brand panel shall read "DIESEL".
- c. Each dispenser shall include fluorescent panel lighting that illuminates the product panel and register area of the dispenser when the pump is activated.

7. Hose Retractor

High hose retractor shall be included with dispenser.

D. Each fuel dispenser shall include the following appurtenances where required by Contract Drawings:

1. Product Hose Assembly

Product hose assemblies shall be provided where required by the Contract Drawings. The Contract Drawings show the type, number, size and location of product hose assemblies for the dispenser. Each product hose assembly shall be suitable for use with the products to be stored in the tank system. Each product hose assembly shall have, at a minimum, the following features:

a. Product Hose

The product hose shall be constructed of synthetic rubber tubing, with wire braid reinforcement, and a synthetic rubber cover. The product hose shall be colored in accordance with the American Petroleum Institute Color and Symbol Code. The product hose shall have the proper fittings installed on each end of the hose. The product hose shall be 1-inch in diameter by 25 feet long.

b. Nozzle

Each nozzle shall be constructed of an aluminum body and steel lever with an automatic shut-off device that shuts off flow through nozzle if it falls from the tank or raises above horizontal. Each nozzle shall be equipped with a full grip guard and splashguard colored in accordance with the American Petroleum Institute Color and Symbol Code.

c. Breakaway

Each breakaway shall be constructed of an aluminum body, die-cast zinc coupling, and zinc plated steel springs. Each breakaway shall be designed to separate when subject to a pull force of less than 300 pounds. Each breakaway shall be constructed of double poppet and shall be designed to minimize fuel spillage after breakaway.

d. Swivel

Each swivel shall be constructed of a high aluminum zinc body with double O-ring seals at each swivel joint. Each swivel shall be designed to provide a full 360-degree spherical rotation with multiple planes of rotation.

2. Fuel Filter Assembly

Fuel filter assemblies shall be provided for each dispenser hose assembly. Each fuel filter assembly shall include an external filter housing, with a filter cartridge installed and a spare filter cartridge.

3. Hose Retractor Assembly

Hose retractor assemblies shall be provided where required by the Contract Drawings. The Contract Drawings show the type, number, size and location of hose retractor assemblies for the dispenser. The hose retractor assembly shall have, at a minimum, the following features:

a. Hose Retractor

The hose retractor shall be constructed of a steel retractor, a stainless steel cable and counter weights, and shall be capable of swiveling in 360-degree rotation for ease of vehicle fueling.

b. Hose Retractor Support Pole

The hose retractor support pole shall be constructed of 2-inch NPT threaded Schedule 80 black steel or galvanized steel, as shown on Contract Drawings, or approved equal. Height of each support pole and foundation anchoring shall be as shown on Contract Drawings.

c. Hose Support Cradle

The hose support cradle shall be constructed of durable polyurethane, shall be shaped to cradle and protect product hose to prevent kinking or collapse of hose, and shall provide an attachment point for the retractor cable.

**2.06 TANK IDENTIFICATION AND SIGNAGE**

- A. Permanent stencils, labels, or plates shall be mounted on tanks and fill ports; and shall include the following information:
1. Manufacturer's statement that tank conforms with Bulk Storage Regulation 6 NYCRR Part 614
  2. Standard of design by which tank was manufactured
  3. List of products and additives that may be permanently stored in tank
  4. Year in which tank was manufactured
  5. Unique identification number
  6. Dimensions, design, working capacity, and tank model number
  7. Name of tank manufacturer
  8. Date of tank installation (fill port only)
  9. Statement indicating "Approved by the New York City Fire Department"
- B. The following signs shall be installed at all active diesel fuel sites:
1. Fill box Manhole Cover:  
  
A 6-inch by 6-inch sign indicating the product type and tank capacity. Fasten with six (6) #6 self tapping stainless steel screws.
  2. Overfill Alarm:  
  
A 20-inch by 16-inch black and yellow sign stating: "CAUTION: When Alarm Sounds, Tank Filled to Capacity, DO NOT OVERFILL", shall be placed in the immediate vicinity of the flashing red alarm light.
  3. Dispenser
    - a. A 10-inch high by 14-inch wide sign shall be placed on or near the dispenser island stating the following: "NO SMOKING WHILE REFUELING". The sign shall be black and red in color, with a white background.
    - b. A 10-inch high by 14-inch wide sign shall be placed on or near the dispenser island stating the following: "SHUT OFF ENGINE WHILE REFUELING". The sign shall be black and red in color with a white background.



4. Emergency Shut-off Sign

Two 12-inch by 18-inch signs stating "EMERGENCY SHUT-OFF SWITCH" shall be placed as shown on the Contract Drawings.

2.07 EMERGENCY SHUT-OFF SWITCH

One emergency shutoff switch shall be installed directly west of the Monitoring Building as shown on the Contract Drawings and as specified in SECTION 262415: INSTRUMENTATION AND CONTROLS.

2.08 PETROLEUM PRODUCT PIPING

All petroleum product piping including fill lines, product supply and return lines, and vent lines, shall be in accordance with SECTION 231113: PETROLEUM PRODUCT PIPING.

2.09 INSTRUMENTATION AND CONTROL

All instrumentation and control, including leak detection, inventory monitoring, and alarms, shall be in accordance with SECTION 262415: INSTRUMENTATION AND CONTROL.

PART 3 – EXECUTION

3.01 GENERAL

- A. Maintain site in a neat and workmanlike manner. Remove debris, dirt, rubbish, etc., from site at end of each day.
- B. Contractor is responsible for verifying all dimensions in field and for ensuring that interferences do not exist between Contractor's work and that of surrounding work.
- C. Initiate a safety program to prevent injury to residents, employees and visitors. Do not block streets or exits.
- D. Provide and maintain any structures or lighting and take all measures required by law for protection of public.
- E. Perform contract work so that no injury or damage will occur to public, structures and property including streets, paving, monitoring wells, recovery wells, sewers, water, electric or any other pipes, mains and conduits. Should any damage or injury be caused by Contractor or anyone in his employ, or by improper or defective workmanship under this contract, Contractor shall repair such damage and assume all responsibility for such injury without cost to the City of New York.
- F. At excavations, provide barriers on same day that excavation is made and check barrier integrity daily so that protection is provided at all times.

### 3.02 PRODUCT DELIVERY AND STORAGE

The Contractor shall coordinate delivery and storage of all material, tools, and equipment with site personnel and the Construction Manager.

### 3.03 INSTALLATION

- A. All equipment installed by the Contractor shall be installed in accordance with the manufacturer's instructions.
- B. Each spill containment fill box assembly shall be located at least 10-feet from any building entrance as required by the New York City Fire Prevention Code.
- C. Provide and install a properly colored wall sign as per Fire Prevention Rule 6.4.4 at location of fill terminal, designating the type of fuel to be delivered. The sign shall be screwed to the wall and in plain view.
- D. All painting work shall be performed in accordance with SECTION: PAINTING

### 3.04 TESTING

- A. Shop Tests: Shop testing of the tanks shall conform to the testing methods and procedures established in the above Subpart: Applicable Standards. Where Fs are detected, the tanks must be repaired as recommended by standards.
- B. Field Test: Field testing shall conform to requirements of the manufacturer, FDNY Bureau of Fire Prevention and Contract Drawings.
- C. Each tank containment sump assembly shall be tested in accordance with the manufacturer's testing equipment and methods to verify the integrity of the sump assembly. This test shall demonstrate that the sump assembly, including all piping and conduit entry boots, the tank manway, and the manhole cover and frame assembly, is watertight. Each containment sump assembly shall be tested in the presence of the Construction Manager at different stages of installation to verify the integrity of the sump assembly. This test shall be performed on each sump assembly after installation of piping and conduit, after placement of backfill, and when tank top slab is installed and installation is complete. If a sump assembly fails this test, the Contractor shall take appropriate steps, at his expense, to correct the installation until he can show that the sump is watertight.

### 3.05 WARRANTIES

The Contractor shall provide the following manufacturer warranties for major tank related equipment:

- Manhole, frame, skirt and cover – 3 years.
- Overfill prevention valve – 1 year.
- Direct fill sump, containment sump and dispenser pan – 3 years.
- Diesel dispenser – 1 year.
- Dispenser nozzle – 1 year.
- 6,000-gallon fiberglass UST – 30 years.

**END OF SECTION**

**NO TEXT ON THIS PAGE**

**SECTION 231113**

**PETROLEUM PRODUCT PIPING**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

The Contractor shall furnish all labor, material, tools, and equipment and install all petroleum product piping, valves, and related appurtenances where required by the Contract Documents.

**1.02 SUBMITTALS**

The Contractor shall submit all manufacturer's specifications, installation instructions, relief valve calculations, pipe test results, and emergency vent sizing to the Construction Manager for approval in accordance with SECTION: SUBMITTALS.

**1.03 APPLICABLE STANDARDS**

The publications are referred to in the text by basic designation and shall be the latest published version.

- American Society for Testing and Materials (ASTM)
  - ASTM A 53      Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
  - ASTM D 2996    Specification for Filament-Wound Fiberglass (Glass-Fiber- Reinforced Thermosetting-Resin) Pipe

Piping and accessories shall comply with ANSI, ASTM, ASME, AWWA, ISA, and all other applicable federal, state, and municipal codes including revisions to date of the Contract.

**PART 2 - MATERIALS**

**2.01 FIBERGLASS PRODUCT PIPING AND FITTINGS**

- A.      Fiberglass product piping and fitting systems shall be provided where required by the Contract Drawings. The Contract Drawings show the type, number, size and location of fiberglass product piping systems for the site. Each fiberglass product piping system shall be double walled Fiberglass Pipe and Fittings as manufactured by Ameron Fiberglass Pipe Division, of Houston, Texas, or approved equal. Alternative manufacturers include The Brugg Group and National Oilwell Varco, Inc.
- B.      Each piping system shall be constructed of fiberglass-reinforced epoxy and shall be suitable for use with the products to be stored in the tank system. The piping system shall be UL-listed and approved for use in New York City by the New York City Fire

Department. In addition, diesel and gasoline piping systems shall be suitable for use with 100% methanol.

- C. Each fiberglass piping and fitting joint shall be adhesive-bonded. The pipe shall have a minimum pressure rating of 175 psig and fittings shall have a minimum pressure rating of 100 psig.

## 2.02 FIBERGLASS SECONDARY CONTAINMENT PIPING AND FITTINGS

- A. Fiberglass secondary containment piping and fitting systems shall be provided where required by the Contract Drawings. The Contract Drawings show the type, number, size and location of fiberglass secondary containment piping systems for the site. Each fiberglass secondary containment piping system shall be LCX Fiberglass Secondary Containment Pipe and Fittings, as manufactured by Ameron Fiberglass Pipe Division, of Houston, Texas, or approved equal. Alternative manufacturers include the Brugg Group and National Oilwell Varco, Inc.
- B. Each secondary containment piping system shall be constructed of fiberglass-reinforced epoxy and shall be suitable for use with the products to be stored in the tank system. The piping system shall be UL-listed and approved for use in New York City by the New York City Fire Department. In addition, diesel and gasoline secondary containment piping systems shall be suitable for use with 100% methanol.
- C. Each fiberglass secondary containment piping and fitting joint shall be adhesive-bonded. The pipe and fittings shall have a minimum pressure rating of 100 psig.
- D. Each secondary containment piping system shall be designed and constructed to retain any leakage and to channel such leakage to a location equipped with an automatically monitored leak detection system. The secondary containment piping system shall provide 100 percent containment of the underground primary piping, including any underground flexible connectors.
- E. Centralizers shall be used to separate the primary and secondary piping as indicated on the Contract Drawings. Centralizers shall be compatible with the manufacturer, type, and size of the primary and secondary piping.

## 2.03 GALVANIZED STEEL PIPING AND FITTINGS

- A. Galvanized steel piping and fittings shall be provided where required by the Contract Drawings. The Contract Drawings show the type, number, size and location of galvanized steel piping and for the site.
- B. All galvanized steel piping, unless otherwise specified, shall be standard weight, Schedule 80, ASTM A53, Grade B, welded galvanized steel pipe. Each length of pipe shall be stamped with the trademark of the manufacturer. The pipe shall be free of flaws, blisters, cracks, and all other imperfections or defects that could impair its quality. All pipe shall be tested by the manufacturer under standard test pressure.

- C. Each fitting and pipe connection shall be screw-type, except where otherwise indicated on the Contract Drawings, or specified herein. Flanged connections shall be used where indicated on the Contract Drawings, or where approved by the Construction Manager.
- D. All pipe threads shall be NPT standard, accurately and cleanly cut, without defects and flaws. Nipples shall be of the same material and weight as the pipe installed. The use of running nipples shall not be permitted.
- E. Each fitting, unless otherwise specified, shall be malleable iron, Class 150, with a working pressure of 300 psig at 150 degrees Fahrenheit.
- F. All galvanized steel piping, fittings, pipe dope and other compounds used in joining the pipe and fittings shall be suitable for use with the petroleum fluids with which they are intended to be used. The pipe and fittings shall be approved for use in New York City by the New York City Fire Department.
- G. Each union shall have bronze to bronze seats and shall be furnished and installed adjacent to, and on, the downstream side of each threaded-end valve, and where shown on Contract Drawings, or as directed by the Construction Manager.

#### 2.04 FLEXIBLE CONNECTORS

- A. Flexible connectors used in tank sumps, above ground applications, and below ground applications shall be constructed of 321 Series stainless steel braid reinforcement and inner core.
- B. Each flexible connector shall be UL-listed and approved by the New York City Fire Department. Each flexible connector shall be suitable for pressure or suction applications. Each flexible connector shall be constructed of materials compatible with the product to be stored in the tank system. In addition, diesel and gasoline flexible connectors shall be suitable for use with 100% methanol.
- C. Each flexible connector shall have a minimum pressure rating of 50 psig and shall be suitable for use with pressurized fuel delivery.
- D. The length of each flexible connector shall be sufficient to provide a flexible connection between the piping that will allow adequate movement of the pipes and adsorption of line shock during operation of the system, settlement, stresses on the pipes, etc.

#### 2.05 VALVES

- A. Mechanical Overfill Prevention Valve

Mechanical overfill prevention valves shall be provided where required by the Contract Drawings. The Contract Drawings show the type, number, size and location of mechanical overfill prevention valves for the tank. Each mechanical overfill prevention valve shall have a vertical orientation, as manufactured by OPW Fuel Management Systems, Inc., or approved equal. Alternative manufacturers include Universal Valve Company and Morrison Brothers Company.

1. Each mechanical overfill prevention valve shall be constructed of cast aluminum, with a stainless steel shaft and reinforced polyethylene float system. Each mechanical overfill prevention valve shall be suitable for use with the products to be stored in the tank system. In addition, diesel and gasoline mechanical overfill prevention valves shall be suitable for use with 100% methanol. Each mechanical overfill prevention valve shall be UL-listed and approved for use in New York City by the New York City Fire Department.
2. Each mechanical overfill prevention valve shall be suitable for use with gravity fuel delivery. Each mechanical overfill prevention valve shall be a gradual shut-off valve, designed to begin to restrict flow when product level reaches 90 percent of the tank capacity, and gradually increase flow restriction until the product level reaches 95 percent of the tank capacity. Each mechanical overfill prevention valve shall be designed to completely shut off flow to the tank when product level reaches 95 percent of the tank capacity. Each mechanical overfill prevention valve shall be adjustable so that these restriction and shut-off levels can be attained in the storage tank.
3. Each mechanical overfill prevention valve shall be fitted with a 4 inch diameter heavy wall aluminum drop tube suitable for use with gravity fuel delivery. Each drop tube shall be sized to be compatible with the overfill prevention valve and the storage tank. Each drop tube shall be suitable for use with the products to be stored in the tank system.

**B. Product Line Shear Valves**

Product line shear valves shall be provided where required by the Contract Drawings. The Contract Drawings show the type, number, size and location of product line shear valves for the tank system. Each product line shear valve shall be constructed with two poppets, with a poppet in the lower main housing to prevent product loss from the tank side of the piping, and a second poppet in the upper housing to prevent product loss from the dispenser. Each product line shear valve shall be constructed of materials compatible with the product to be stored in the tank system. Each product line shear valve shall be constructed to meet the standards set forth in NFPA 30, and shall be constructed of metals capable of withstanding temperatures specified in NFPA 30. Each product line shear valve shall be UL-listed and approved for use in New York City by the New York City Fire Department. Each product line shear valve shall be manufactured by Universal Valve Company, or approved equal. Alternative manufacturers include OPW Fuel Management Systems, Inc. and Morrison Brothers Company.

**C. Ball Valves**

Ball valves shall be provided where required by the Contract Drawings. The Contract Drawings show the type, number, size and location of ball valves for the tank. Each ball valve shall be constructed of a carbon steel body, a solid ball, a stainless steel stem, and double o-rings to prevent leakage. Each ball valve shall be constructed with seals and other materials that are suitable for use with the products to be stored in the tank system. In addition, ball valves shall be suitable for use with 100% methanol. Each ball valve shall



have a 2000-psi W.O.G. pressure rating. Each ball valve shall be UL-listed and approved for use in New York City by the New York City Fire Department.

**D. Solenoid Valves**

Solenoid valves shall be provided where required by the Contract Drawings. The Contract Drawings show the number, size and location of solenoid valves for the tank. Each solenoid valve shall be constructed of a forged brass body, a bronze piston, and stainless steel internal metal parts. Each solenoid valve shall be constructed with a normally closed, hung piston. Each solenoid valve shall be constructed with seals and other materials that are suitable for use with the products to be stored in the tank system. In addition, solenoid valves shall be suitable for use with 100% methanol.

**E. Angle Check Valves**

Angle check valves shall be provided in the suction line tank.

**F. Union Check Valves**

Union check valves shall be provided where required by the Contract Drawings. The Contract Drawings show the number, size and location of union check valves for the tank system. Each union check valve shall have a brass stem, stainless steel spring, and a brass, 20-mesh screen, and shall be designed for installation in a union. Each union check valve shall be manufactured by OPW Fuel Management Systems, Inc. of Cincinnati, Ohio, or approved equal. Alternative manufacturers include Universal Valve Company and Morrison Brothers Company.

**G. Vertical Check Valves**

Vertical check valves shall be provided where required by the Contract Drawings. The Contract Drawings show the number, size and location of vertical check valves for the tank system. Each vertical check valve shall be constructed of a bronze body, a single brass poppet, an aluminum cage, and a brass screen, with a union connection on top. Each vertical check valve shall have a low-pressure drop through the valve, a removable cage for inspection and cleaning, and a self-aligning poppet for a tight seal. Each vertical check valve shall be manufactured by OPW Fuel Systems Management, Inc. of Cincinnati, Ohio, or approved equal. Alternative manufacturers include Universal Valve Company and Morrison Brothers Company.

**H. Foot Valves**

Foot valves shall be provided where required by the Contract Drawings. The Contract Drawings show the number, size and location of foot valves for the tank. Each foot valve shall be of all metal construction, with a metal-to-metal seat and a stainless steel, 20-mesh screen. Each foot valve shall be manufactured by Morrison Brothers Company, Dubuque, Iowa, or approved equal. Alternative manufacturers include Universal Valve Company and OPW Fuel Systems Management, Inc.

I. Anti-Syphon Valves (Type I)

Type I Anti-syphon valves shall be provided where required by the Contract Drawings. The Contract Drawings show the type, number, size and location of anti-syphon valves for the tank. Each Type I anti-syphon valve shall be constructed of cast-iron body with precision-machine valve seats. Each Type I anti-syphon valve shall be provided with the appropriate spring that provides for the proper operation of the anti-syphon valve at it's intended location. Each Type I anti-syphon valve shall be manufactured by Universal Valve Company, Elizabeth, New Jersey, or approved equal. Alternative manufacturers include OPW Fuel Management Systems, Inc. and Morrison Brothers Company.

J. Anti-Syphon Valves (Type II)

Type II Anti-syphon valves shall be provided where required by the Contract Drawings. The Contract Drawings show the type, number, size and location of anti-syphon valves for the tank. Each Type II anti-syphon valve shall be constructed of a bronze body with a dash pot for noiseless operation. Each Type II anti-syphon valve shall be UL-listed and approved for use in New York City by the New York City Fire Department. Each Type II anti-syphon valve shall be provided with the appropriate spring that provides for the proper operation of the anti-syphon valve at it's intended location. Each Type II anti-syphon valve shall be manufactured by Preferred Utilities Manufacturing Corporation, Danbury, Connecticut, or approved equal. Alternative manufacturers include OPW Fuel Management Systems, Inc. and Morrison Brothers Company.

K. Fire Shut Off Valves

Fire shut-off valves shall be provided where required by the Contract Drawings. The Contract Drawings show the number, size and location of fire shut-off valves for the tank. Each fire shut-off valve shall be constructed of a bronze body and disc, with a spring-loaded, lever-operated closing mechanism that is held open by a fusible link that is arranged so that the valve will automatically close if the link melts. Each fire shut-off valve shall be UL-listed and approved for use in New York City by the New York City Fire Department. Each fire shut-off valve shall be provided with the appropriate spring and fusible link that provides for the proper operation of the fire shut-off valve at it's intended location. Each fire shut-off valve shall be manufactured by Preferred Utilities Manufacturing Corporation, Danbury, Connecticut, or approved equal. Alternative manufacturers include OPW Fuel Management Systems, Inc. and Morrison Brothers Company.

2.06 STRAINERS

Strainers shall be provided where required by the Contract Drawings. The Contract Drawings show the type, number, size and location of strainers for the tank system. Each strainer shall be of all metal construction with a brass body and spring, and stainless steel, 20-mesh screen to filter out debris. Each strainer shall be manufactured by OPW Fuel Management Systems, Inc., of Cincinnati, Ohio, or approved equal. Alternative manufacturers include Universal Valve Company and Morrison Brothers Company.

## 2.07 VENT CAPS

Vent Caps shall be provided where required by the Contract Drawings. The Contract Drawings show the type, number, size and location of vent caps for the tank system. Each vent cap shall be of all metal construction, with a flame-retardant bronze, 40-mesh screen, and shall conform to NFPA 30. Each vent cap shall prevent water and contaminants from entering tank, and assure easy runoff from precipitation.

### A. Primary Tank Vent Caps

Primary tank vent caps shall be provided where required by the Contract Drawings. Each primary tank vent cap shall assure even storage tank pressure during tank filling and product dispensing operations. Each primary tank vent cap shall be manufactured by Universal Valve Company, Elizabeth, New Jersey, or approved equal. Alternative manufacturers include OPW Fuel Management Systems, Inc. and Morrison Brothers Company.

### B. Vent Whistle

Vent whistle shall be installed on the tank vent.

## 2.08 EXTRACTOR FITTINGS

Extractor fittings shall be provided where required by the Contract Drawings. The Contract Drawings show the number, size and location of extractor fittings for the tank system. Each extractor fitting shall be constructed of a cast iron body with a corrosion resistant coating. Each extractor fitting shall include a bronze outer plug for normal operation, and a bronze inner plug for testing. Each extractor fitting shall be manufactured by OPW Fuel Management Systems, Inc. of Cincinnati, Ohio. Alternative manufacturers include Universal Valve Company and Morrison Brothers Company.

## 2.09 FILL ADAPTER FITTINGS

Fill adapter fittings shall be provided where required by the Contract Drawings. The Contract Drawings show the type, number, size and location of fill adapter fittings for the tank system. Each fill adapter fitting shall be constructed of hard coated aluminum or bronze. Each fill adapter fitting shall be manufactured by OPW Fuel Management Systems, Inc. of Cincinnati, Ohio, or approved equal. Alternative manufacturers include Universal Valve Company and Morrison Brothers Company.

## 2.10 DRY DISCONNECT FILL FITTINGS

Dry disconnect fill fittings shall be provided where required by the Contract Drawings. The Contract Drawings show the number, size and location of dry disconnect fill fittings for the tank system. Each dry disconnect fill fitting shall be constructed of aluminum or stainless steel, with a metal spring and metal poppet. Each dry disconnect fill fitting shall be suitable for use with the products to be stored in the tank system. In addition, the disconnect fill fittings shall be suitable for use with 100% methanol. Each dry disconnect fill adapter fitting shall be manufactured by OPW Fuel Management Systems, Inc. of Cincinnati, Ohio, or, approved equal. Alternative manufacturers include Universal Valve Company and Morrison Brothers Company.

## 2.11 FILL PIPE

Furnish and install 4 inch diameter heavy wall aluminum submerged drop tube in fill line of the petroleum storage tank as indicated on Contract Drawings. Drop tube shall be manufactured by EBW Inc., or approved equal. Alternative manufacturers include Universal Valve Company and Morrison Brothers Company.

## PART 3 - EXECUTION

### 3.01 PIPING INSTALLATION

#### 3.01.1 Underground Storage System

- A. All fiberglass piping shall be installed in pea gravel, in accordance with the Manufacturer's recommendations, applicable codes, and as shown on Contract Drawings. Pea gravel shall be placed in accordance with SECTION: FILLING, BACKFILLING AND COMPACTING FOR STRUCTURES.
- B. Slope all suction and return lines towards tank sump at minimum of 1 inch per 8 foot of pipe, or as approved by the Construction Manager. Double swing joints of three elbows, or other flexible connectors acceptable to the FDNY Bureau of Fire Prevention, shall be provided in suction, discharge, vent and fill piping except that only a single swing joint shall be required at vertical riser of vent line.
- C. Provide each tank with separate vent pipe not less than 2 inches diameter, terminated outdoors in non-hazardous location, be well braced in position, at least 10 feet from nearest building opening, and provided with weather-proof hood having free area at least pipe size area. Vent pipes shall not be obstructed by devices that reduce its capacity, thus causing excessive back pressure. Vent pipes shall be run from tank to outer air higher than fill pipe opening and, for tanks located outside buildings, at least 15 feet above adjacent ground level.
- D. All pipes and valves, except where otherwise indicated, shall be arranged so as to be easily accessible for maintenance and repairs. No change in the general arrangement indicated on the Contract Drawings will be allowed unless approved by the Construction Manager. Where lengths of pipe are finally assembled, the fittings shall be in correct alignment without forcing them into position.
- E. All pipes shall be cut accurately. Deformed or damaged pipe shall in no case be used. All bends shall be made with standard elbows and fittings. All threads shall be cleaned thoroughly and covered with suitable joint compound before joints are made. Every piece of pipe, valve, and fitting which is part of the pipe work shall be cleaned thoroughly before and, whenever possible, after installation.
- F. All piping shall be installed true to line and grade and be supported by suitable supports, spaced not more than 8 feet on centers. All such supports, anchors, clamps, or other devices shall be of standard design, simple in installation, and of an approved manufacturer.

- G. Hangers, brackets, supports, anchors, clamps, and other devices shall be hot-dip galvanized after fabrication and before assembly and installation. They shall be installed to make the entire pipe system self-supporting and rigid. Defective or inaccurately constructed hangers, brackets, supports, clamps and other hardware shall not be used. Machine bolts, 5/8 inch in diameter and of proper length, shall be used throughout for securing the hangers, brackets, clamps, and supports for pipes larger than 3 inches, and 1/2-inch diameter bolts for pipes 3 inches and smaller.
- H. Where required to use expansion bolts for securing supports and hangers, the holes in the masonry shall be drilled to the exact size of the bolts or sleeves. Packing shall not be used. Expansion bolts shall be of an approved type, diameter, and length.
- I. All flanged and mechanical coupling connections shall be made with bolts and nuts of the length and diameter required for the particular flange size as determined by the ANSI.
- J. Proper allowance for expansion and contraction shall be made. Wherever the pipe lengths required are to exact dimensions, and where lengths of pipe are finally assembled, the flanges and fittings shall be in correct alignment without forcing into position.
- K. Ball valves are required for all suction lines, and valve stems shall be vertical where possible and in no case below a horizontal position.
- L. The pipe to be installed shall be free of flaws, blisters, cracks, and all other imperfections or defects that would impair its quality. All pipe shall be tested by the manufacturer under standard test pressure.
- M. Pipe sleeves shall be standard weight, Schedule 40, galvanized steel pipe provided as required by the Contract Drawings.

### 3.02 FLEXIBLE CONNECTORS

The length of the flexible connector shall be adequate to relieve stresses due to movement, settlement, and shifting of the tank and piping, or due to vibration, traffic, etc., and shall be installed so as not to have less than the minimum bending radius of the connectors as recommended by the manufacturer. It shall not transmit excess stress to the threads of the associated fiberglass piping. When the connector is bent, it shall not be distorted out of shape, and its diameter shall not be constricted or obstructed.

Each flexible connector shall be installed such that both fittings and the entire length of flexible connector are inside the secondary containment sump and accessible for maintenance.

### 3.03 MECHANICAL OVERFILL PREVENTION VALVES

Each mechanical overfill prevention valve shall be installed and adjusted so that the valve begins to restrict flow when product level reaches 90 percent of the tank capacity, and gradually increases flow restriction until the product level reaches 95 percent of the tank capacity. Each mechanical overfill prevention valve shall be installed to completely shut off flow to the tank when product level reaches 95 percent of the tank capacity.

#### **3.04 CUTTING OF CONCRETE OR MASONRY**

Where necessary for the proper installation of piping, the Contractor shall cut away or break through concrete or brick masonry and, after installation of said pipes, the Contractor shall replace and refinish masonry to the satisfaction of the Construction Manager in accordance with these specifications.

#### **3.05 TESTING**

The piping systems of this Specification shall be tested as indicated on the Contract Drawings. Each test shall be performed in the presence of the Construction Manager and a New York City Fire Prevention inspector. The Contractor shall provide water, air, and all labor, equipment, and accessories required to perform the tests at no additional cost to the New York City Department of Design and Construction.

Defective pipes and fittings shall be replaced by the Contractor at his own expense with material. All joints examined during the tests and found to be leaking shall be caulked or otherwise be made satisfactory in the opinion of the Construction Manager. Tests shall continue until a passing test is achieved. All test gauges shall be certified for accuracy. All instruments other than test instruments shall be disconnected during testing to prevent damage.

#### **3.06 WARRANTIES**

The Contractor shall provide a 30-year manufacturer warranty for fiberglass double walled piping.

**END OF SECTION**

SECTION 233300

VEHICLE EXHAUST ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vehicle Exhaust Hose
2. Recoil Hose Reel
3. Locking Suction Nozzle
4. Stainless steel hose clamps

1.2 SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each product indicated.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
1. Plans, elevations, sections, and details.
  2. Location and size of each field connection.
  3. Equipment schedules to include rated capacities, furnished specialties, and accessories.
  4. Field quality-control test reports.
  5. Operation and maintenance data.

PART 2 PRODUCTS

2.1 RECOIL HOSE REEL:

- A. The reel shall be comprised of 12ga. support steel coated with a 15 micron thickness aluminum alloy finish for corrosion resistance; drum shall be 16ga material similar to support steel.
- B. The drum ends shall be formed from a 3/8" polypropylene material reinforced with glass fibers for strength.

## **HARPER STREET YARD**

FMS ID# HWQF027C

- C. The rewind spring mechanism shall be capable of lifting 60 lbs. The recoil mechanism shall be located outside and offset from drum mechanism. The recoil mechanism shall be able to be adjusted without rotation of the drum assembly thus not making necessary to unwind hose from the reel to adjust tension and lift on spring mechanism.
- D. Hose reel shall be equipped with an automatic internal damper that will open when hose is extended and close when retracted and a visible indicator on the side of the reel to be supplied.
- E. Reel shall be equipped with hose guide to ensure hose freely moves and coils on reel uniformly, a stop collar shall be supplied to adjust amount of hose that shall hang off reel.
- F. The hose reel shall be fitted with a low voltage micro switch to stop/start fan when the hose is pulled down into use.

### **2.2 LOCKING SUCTION NOZZLE:**

- A. The suction nozzle shall be a circular EPDM rubber type that will accept up 7" dia. Tailpipe and connection to flex hose is 6" dia. The EPDM rubber end shall be a minimum 8 1/2" long and 1/2" thick. The overall length of nozzle shall be 12" long. The connection to hose is via galvanized rotating connection 16ga. with 360 degree ball bearing rotation to eliminate hose kinking and ease of connection for operator. The nozzle to have a debris screen with 1 1/4" square screen (screen shall not hinder airflow). The attachment mechanism shall be a spring loaded flap valve. Handle to be 4" long with 2 1/2" heat isolation handle. (1) nozzle required per hose reel.

### **2.3 EXHAUST HOSE:**

- A. Nederman NFC-3 is a fabric hose is the basis of performance. NFC-3 withstands high temperatures when extracting exhaust from spark ignition engines or diesel engines. The hose is especially suitable when working with trucks or construction machines that produce very hot exhaust. Hose shall be 6" diameter x 35 feet long.
- B. NFC-3 is flame-retardant due to a specially coated, high temperature fabric (Kevlar). The hose can handle extraction of exhaust up to +575°F continuously, when exhaust funnels are used properly. Intermittently NFC-3 can endure +662°F, provided exhaust funnels are used correctly and enough fresh air is supplied.
- C. The lowest temperature resistance is -76°F.
- D. The hose shall be attached to nozzle and hose reel via stainless adjustable clamps.



**PART 3 EXECUTION**

**3.1 INSTALLATION**

- A. Install hose reels and hoses in conformance with manufacturer's instructions. Provide required miscellaneous steel, building attachments and support and clamping hardware to suspend hose reel from existing structure.
- B. Connect hose end to existing vehicle exhaust ductwork with stainless steel draw clamps.
- C. Install suction nozzles per manufacturer's instructions.

**3.2 FIELD QUALITY CONTROL**

- A. Upon installation check all the hose reel and associated hose perform per manufacturer's performance. The test shall be witnessed by contracting officer and client representative. Make adjustments as appropriate and as directed by contracting officer.
- B. Check operation and performance of suction nozzles. Make adjustments as appropriate for proper and fully operational hose exhaust system.

**END OF SECTION**

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**SECTION 238113**

**PACKAGED TERMINAL AIR-CONDITIONERS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section includes packaged terminal air conditioners and their accessories and controls, in the following configurations:
  - 1. Through-the-wall air conditioners.

**1.2 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For packaged terminal air conditioners. Include plans, elevations, sections, details for wall penetrations, and attachments to other work.
  - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Wiring Diagrams: For power, signal, and control wiring.
- C. Field quality-control reports.
- D. Operation and maintenance data.

**1.3 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ECC NYS Compliance: Comply with energy efficiency requirements of Energy Conservation Code of NYS – 2010.
- C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2007.

**1.4 WARRANTY**

- A. **Special Warranty:** Manufacturer's standard form in which manufacturer agrees to repair or replace components of packaged terminal air conditioners that fail in materials or workmanship within specified warranty period.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURED UNITS**

- A. **Description:** Factory-assembled and -tested, self-contained, packaged terminal air conditioner with room cabinet, electric refrigeration system and temperature controls; fully charged with refrigerant and filled with oil; with cord-connected chassis.

**2.2 CHASSIS**

- A. **Cabinet:** Manufacturer's standard with removable front panel with concealed latches.
1. **Mounting:** Wall with wall sleeve.
  2. **Discharge Grille:** Molded discharge grille allowing upward and horizontal airflow.
  3. **Louvers:** Stamped steel with enamel finish; white color. Aluminum outside grille
  4. **Finish:** Epoxy coating.
  5. **Access Door:** Hinged door in top of cabinet for access to controls.
  6. **Finish of Interior Surfaces:** Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2007.
  7. **Wall Sleeves:** Galvanized steel with polyester finish.
- B. **Refrigeration System:** Direct-expansion indoor coil with capillary restrictor; and hermetically sealed scroll compressor with vibration isolation and overload protection.
1. **Indoor and Outdoor Coils:** Seamless copper tubes mechanically expanded into aluminum fins with capillary tube distributor on indoor coil.
  2. **Accumulator.**
  3. **Constant-pressure expansion valve.**
  4. **Charge:** R-410A.
- C. **Indoor Fan:** Forward curved, centrifugal; with motor and positive-pressure ventilation damper with electric operator.
- D. **Filters:** Premium activated carbon filter rated at MERV 6 and adsorbing odors and VOC in conjunction with standard filter
- E. **Condensate Drain:** Drain pan to direct condensate to outdoor coil for re-evaporation and internal drain kit to allow piping to run in wall cavity.
1. **Comply with ASHRAE 62.1-2007 for drain pan construction and connections.**

- F. Outdoor Fan: Propeller type designed for quiet operation.
  - 1. Indoor and Outdoor Fan Motors: Two speed; Comply with NEMA designation, temperature rating, service factor, enclosure type, and EPACT efficiency requirements for motors.
    - a. Fan Motors: Permanently lubricated split capacitor.
    - b. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
    - c. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.

## 2.3 CONTROLS

- A. Control Module: Unit-mounted digital panel with touchpad temperature control and with touchpad for heating, cooling, and fan operation. Include the following features:
  - 1. Low Ambient Lockout Control: Prevents cooling-cycle operation below 40 deg F outdoor air temperature.
  - 2. Remote wall mounted low voltage programmable thermostat for ease of access and control.
- B. Outdoor Air: Open intake when unit indoor air fan runs.

## 2.4 CAPACITIES AND CHARACTERISTICS

- A. As scheduled on plans.

## 2.5 SOURCE QUALITY CONTROL

- A. Sound-Power Level Ratings: Factory test to comply with ARI 300, "Sound Rating and Sound Transmission Loss of Packaged Terminal Equipment."
- B. Unit Performance Ratings: Factory test to comply with ARI 310/380/CSA C744, "Packaged Terminal Air-Conditioners and Heat Pumps."

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install unit's level and plumb, maintaining manufacturer's recommended clearances and tolerances.

**HARPER STREET YARD**

FMS ID# HWQF027C

- B. Install wall sleeves in finished wall assembly; seal and weatherproof. Joint-sealant materials and applications are specified in Division 07 Section "Joint Sealants."
- C. Install and anchor wall sleeves to withstand, without damage to equipment and structure, seismic forces required by building code.

**3.2 FIELD QUALITY CONTROL**

- A. Tests and Inspections:
  - 1. Inspect for and remove shipping bolts, blocks, and tie-down straps.
  - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation.
  - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Packaged terminal air conditioners will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

**END OF SECTION**

**SECTION 238233 – ELECTRIC BASEBOARD HEATERS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes the following:

1. Electric baseboard radiators.

**1.2 SUBMITTALS**

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each type of product indicated.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- C. Field quality-control test reports.
- D. Operation and maintenance data.

**1.3 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

**PART 2 - PRODUCTS**

**2.1 ELECTRIC BASEBOARD RADIATORS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Berko Electric Heating; a division of Marley Engineered Products.
  2. Marley Electric Heating; a division of Marley Engineered Products.
  3. Ouellet Canada Inc.
  4. Qmark Electric Heating; a division of Marley Engineered Products.
- B. Description: Factory-packaged units constructed according to UL 499, UL 1030, and UL 2021.

## HARPER STREET YARD

FMS ID# HWQF027C

- C. Heating Elements: Nickel-chromium-wire heating element enclosed in metallic sheath mechanically bonded to fins, with high-temperature cutout and sensor running the full length of the element. Element supports shall eliminate thermal expansion noise.
- D. Rust-Resistant Enclosures: Minimum 0.052-inch thick ASTM A 653/A 653M, G60 galvanized-steel, removable front cover.
  - 1. Full-height back.
  - 2. Full-length damper.
  - 3. End panel.
  - 4. **End caps.**
  - 5. Inside and outside corners.
  - 6. Joiner pieces to snap together.
  - 7. Finish: Baked-enamel finish in manufacturer's **standard** color as selected by Architect.
  - 8. Element Brackets: Primed and painted steel to support front panel and element.
- E. Unit Controls: **Remote line-voltage thermostat.**
- F. Accessories:
  - 1. Filler sections without a heating element matching the adjacent enclosure.
  - 2. Straight-blade-type receptacles complying with DSCC W-C-596G/GEN, NEMA WD 1, NEMA WD 6, and UL 498; in color selected by Architect.

## PART 3 - EXECUTION

### 3.1 BASEBOARD RADIATOR INSTALLATION

- A. Install units level and plumb.
- B. Install enclosure continuously around corners, using outside and inside corner fittings.
- C. Join sections with splice plates and filler pieces to provide continuous enclosure.
- D. Install enclosure continuously from wall to wall or as noted on plans
- E. Terminate enclosures with manufacturer's end caps except where enclosures are indicated to extend to adjoining walls.

### 3.2 CONNECTIONS

- A. Ground electric convection heating units according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- B. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."



**3.3 FIELD QUALITY CONTROL**

- A. Perform the following field tests and inspections and prepare test reports:**
  - 1. Operational Test:** After electrical circuitry has been energized, start units to confirm proper convection heating unit operation.
  - 2. Test and adjust controls and safeties.** Replace damaged and malfunctioning controls and equipment.
- B. Remove and replace convection heating units that do not pass tests and inspections and retest as specified above.**

**END OF SECTION**

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**SECTION 260500**

**COMMON WORK RESULTS FOR ELECTRICAL**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section Includes:
  - 1. Electrical equipment coordination and installation.
  - 2. Sleeves for raceways and cables.
  - 3. Sleeve seals.
  - 4. Grout.
  - 5. Common electrical installation requirements.

**1.3 DEFINITIONS**

- A. NBR: Acrylonitrile-butadiene rubber.

**1.4 SUBMITTALS**

- A. Product Data: For sleeve seals.

**1.5 COORDINATION**

- A. Coordinate arrangement, mounting, and support of electrical equipment:
  - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
  - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
  - 3. To allow right of way for piping and conduit installed at required slope.
  - 4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

## **PART 2 - PRODUCTS**

### **2.1 SLEEVES FOR RACEWAYS AND CABLES**

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Sleeves for Rectangular Openings: Galvanized sheet steel.
  - 1. Minimum Metal Thickness:
    - a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
    - b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

### **2.2 SLEEVE SEALS**

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
- B. 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:
  - a. Advance Products & Systems, Inc.
  - b. Calpico, Inc.
  - c. Metraflex Co.
  - d. Pipeline Seal and Insulator, Inc.
- C. Sealing Elements: NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
- D. Pressure Plates: Stainless steel. Include two for each sealing element.
- E. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

### **2.3 GROUT**

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

## **PART 3 - EXECUTION**

### **3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION**

- A. Comply with NECA 1.

- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

**3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS**

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
  - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

- K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
  - L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.
- 3.3 SLEEVE-SEAL INSTALLATION
- A. Install to seal exterior wall penetrations.
  - B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- 3.4 FIRESTOPPING
- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

**END OF SECTION**

**SECTION 260519**

**LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Building wires and cables rated 600 V and less.
  - 2. Connectors, splices, and terminations rated 600 V and less.
  - 3. Sleeves and sleeve seals for cables.

**1.3 DEFINITIONS**

- A. NBR: Acrylonitrile-butadiene rubber.

**1.4 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For testing agency.
- C. Field quality-control test reports.

**1.5 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.
- C. Comply with NYC Electric Code NFPA 70.

**1.6 COORDINATION**

- A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

**PART 2 - PRODUCTS**

**2.1 CONDUCTORS AND CABLES**

- 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. Alcan Products Corporation; Alcan Cable Division.
  - 2. American Insulated Wire Corp.; a Leviton Company.
  - 3. General Cable Corporation.
  - 4. Senator Wire & Cable Company.
  - 5. Southwire Company.
- B. Copper Conductors: Comply with NEMA WC 70.
- C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.
- D. Multiconductor Cable: Comply with NEMA WC 70 for armored cable, Type AC with ground wire.

**2.2 CONNECTORS AND SPLICES**

- 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. AFC Cable Systems, Inc.
  - 2. Hubbell Power Systems, Inc.
  - 3. O-Z/Gedney; EGS Electrical Group LLC.
  - 4. 3M; Electrical Products Division.
  - 5. Tyco Electronics Corp.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

**2.3 SLEEVES FOR CABLES**

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."



## **2.4 SLEEVE SEALS**

- 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. Advance Products & Systems, Inc.
  - 2. Calpico, Inc.
  - 3. Metraflex Co.
  - 4. Pipeline Seal and Insulator, Inc.
- B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
  - 1. Sealing Elements: NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
  - 2. Pressure Plates: Stainless steel. Include two for each sealing element.
  - 3. Connecting Bolts and Nuts Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

## **PART 3 - EXECUTION**

### **3.1 CONDUCTOR MATERIAL APPLICATIONS**

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

### **3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS**

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-THWN, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
- E. Exposed Branch Circuits, Including in Crawlspace: Type THHN-THWN, single conductors in raceway or armored cable.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

### 3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."
- F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

### 3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

### 3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Rectangular Sleeve Minimum Metal Thickness:
  - 1. For sleeve rectangle perimeter less than 50 inches (1270 mm) and no side greater than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).

2. For sleeve rectangle perimeter equal to, or greater than, 50 inches (1270 mm) and 1 or more sides equal to, or greater than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).
- E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- F. Cut sleeves to length for mounting flush with both wall surfaces.
- G. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.
- H. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and cable unless sleeve seal is to be installed.
- I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.
- J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 07 Section "Joint Sealants."
- K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 07 Section "Penetration Firestopping."
- L. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.
- M. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- N. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between cable and sleeve for installing mechanical sleeve seals.

### 3.6 SLEEVE-SEAL INSTALLATION

- A. Install to seal underground exterior-wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

**3.7 FIRESTOPPING**

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping."

**3.8 FIELD QUALITY CONTROL**

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
  - 1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
  - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- C. Test Reports: Prepare a written report to record the following:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- D. Remove and replace malfunctioning units and retest as specified above.

**END OF SECTION**

**SECTION 260526**

**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes methods and materials for grounding systems and equipment.
  - 1. Underground distribution grounding.
  - 2. Common ground bonding with lightning protection system.

**1.3 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in Part 3 "Field Quality Control" Article, including the following:
  - 1. Test wells.
  - 2. Ground rods.
  - 3. Ground rings.
  - 4. Grounding arrangements and connections for separately derived systems.
- C. Qualification Data: For testing agency and testing agency's field supervisor.
- D. Field quality-control test reports.

**1.4 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with UL 467 for grounding and bonding materials and equipment.
- C. Comply with NYC Electric Code NFPA 70.

## **PART 2 - PRODUCTS**

### **2.1 CONDUCTORS**

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
  - 1. Solid Conductors: ASTM B 3.
  - 2. Stranded Conductors: ASTM B 8.
  - 3. Tinned Conductors: ASTM B 33.
  - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
  - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
  - 6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
  - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
- C. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 2 inches (6 by 50 mm in cross section, unless otherwise indicated; with insulators.

### **2.2 CONNECTORS**

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
  - 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

### **2.3 GROUNDING ELECTRODES**

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet (19 mm by 3 m) in diameter.

## **PART 3 - EXECUTION**

### **3.1 APPLICATIONS**

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.
  - 1. Bury at least 24 inches (600 mm) below grade.
  - 2. Duct-Bank Grounding Conductor: Bury 12 inches (300 mm) above duct bank when indicated as part of duct-bank installation.
- C. Conductor Terminations and Connections:
  - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
  - 2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
  - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
  - 4. Connections to Structural Steel: Welded connectors.
- D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
  - 1. Install bus on insulated spacers 1 inch (25 mm), minimum, from wall 6 inches (150 mm) above finished floor, unless otherwise indicated.
  - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, down to specified height above floor, and connect to horizontal bus.

### **3.2 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS**

- A. Comply with IEEE C2 grounding requirements.
- B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.
- C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or

plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

### 3.3 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
  - 1. Feeders and branch circuits.
  - 2. Lighting circuits.
  - 3. Receptacle circuits.
  - 4. Single-phase motor and appliance branch circuits.
  - 5. Three-phase motor and appliance branch circuits.
  - 6. Flexible raceway runs.
  - 7. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
- C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- D. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

### 3.4 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.
  - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
  - 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Test Wells: Ground rod driven through drilled hole in bottom of handhole.



1. Test Wells: Install at least one test well for each service, unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
  2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
  3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.
- E. Grounding and Bonding for Piping:
1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
  2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
  3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- F. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.
- G. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of building.
1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
  2. Bury ground ring not less than 24 inches (600 mm) from building foundation.

### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:
- B. Perform the following tests and inspections and prepare test reports:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
  2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
    - a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    - b. Perform tests by fall-of-potential method according to IEEE 81.
  3. Prepare dimensioned drawings locating each test well, ground rod and ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- C. Report measured ground resistances that exceed the following values:
1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.
  2. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohms.
  3. Substations and Pad-Mounted Equipment: 5 ohms.
  4. Manhole Grounds: 10 ohms.
- D. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

**END OF SECTION**

**SECTION 260529**

**HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Hangers and supports for electrical equipment and systems.
  - 2. Construction requirements for concrete bases.

**1.3 DEFINITIONS**

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

**1.4 PERFORMANCE REQUIREMENTS**

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

**1.5 SUBMITTALS**

- A. Welding certificates.

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### **1.6 QUALITY ASSURANCE**

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NYC Electric Code NFPA 70.

### **1.7 COORDINATION**

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

## **PART 2 - PRODUCTS**

### **2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS**

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
  - 1. 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:
    - a. Allied Tube & Conduit.
    - b. Cooper B-Line, Inc.; a division of Cooper Industries.
    - c. ERICO International Corporation.
    - d. GS Metals Corp.
    - e. Thomas & Betts Corporation.
    - f. Unistrut; Tyco International, Ltd.
    - g. Wesanco, Inc.
  - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of

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conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
  - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
    - 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) Hilti Inc.
      - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      - 3) MKT Fastening, LLC.
      - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
  - 2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
    - 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) Cooper B-Line, Inc.; a division of Cooper Industries.
      - 2) Empire Tool and Manufacturing Co., Inc.
      - 3) Hilti Inc.
      - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      - 5) MKT Fastening, LLC.
  - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
  - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
  - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
  - 6. Toggle Bolts: All-steel springhead type.
  - 7. Hanger Rods: Threaded steel.

## **2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES**

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

## **PART 3 - EXECUTION**

### **3.1 APPLICATION**

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
  - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

### **3.2 SUPPORT INSTALLATION**

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
1. To Wood: Fasten with lag screws or through bolts.
  2. To New Concrete: Bolt to concrete inserts.
  3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
  4. To Existing Concrete: Expansion anchor fasteners.
  5. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
  6. To Light Steel: Sheet metal screws.
  7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

### 3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

### 3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base.
1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

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2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

**END OF SECTION**



**SECTION 260533**

**RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. Related Sections include the following:
  - 1. Division 26 Section "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.

**1.3 DEFINITIONS**

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. EPDM: Ethylene-propylene-diene terpolymer rubber.
- D. FMC: Flexible metal conduit.
- E. IMC: Intermediate metal conduit.
- F. LFMC: Liquidtight flexible metal conduit.
- G. LFNC: Liquidtight flexible nonmetallic conduit.
- H. NBR: Acrylonitrile-butadiene rubber.
- I. RNC: Rigid nonmetallic conduit.

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### **1.4 SUBMITTALS**

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Custom enclosures and cabinets.
  - 2. For handholes and boxes for underground wiring, including the following:
    - a. Duct entry provisions, including locations and duct sizes.
    - b. Frame and cover design.
    - c. Grounding details.
    - d. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
    - e. Joint details.
- C. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
  - 1. Structural members in the paths of conduit groups with common supports.
  - 2. HVAC and plumbing items and architectural features in the paths of conduit groups with common supports.
- D. Qualification Data: For professional engineer and testing agency.
- E. Source quality-control test reports.

### **1.5 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NYC Electric Code NFPA 70.

## **PART 2 - PRODUCTS**

### **2.1 METAL CONDUIT AND TUBING**

- 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. AFC Cable Systems, Inc.

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2. Alflec Inc.
  3. Allied Tube & Conduit; a Tyco International Ltd. Co.
  4. Anamet Electrical, Inc.; Anaconda Metal Hose.
  5. Electri-Flex Co.
  6. Manhattan/CDT/Cole-Flex.
  7. Maverick Tube Corporation.
  8. O-Z Gedney; a unit of General Signal.
  9. Wheatland Tube Company.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
1. Comply with NEMA RN 1.
  2. Coating Thickness: 0.040 inch (1 mm), minimum.
- D. EMT: ANSI C80.3.
- E. LFMC: Flexible steel conduit with PVC jacket.
- F. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
  2. Fittings for EMT: [Steel, set-screw or compression type.
  3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
- G. Joint Compound for Rigid Steel Conduit: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

## 2.2 NONMETALLIC CONDUIT AND TUBING

- 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. AFC Cable Systems, Inc.
  2. Anamet Electrical, Inc.; Anaconda Metal Hose.
  3. Arnco Corporation.
  4. CANTEX Inc.
  5. CertainTeed Corp.; Pipe & Plastics Group.
  6. Condux International, Inc.
  7. ElecSYS, Inc.
  8. Electri-Flex Co.
  9. Lamson & Sessions; Carlon Electrical Products.

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10. Manhattan/CDT/Cole-Flex.
11. RACO; a Hubbell Company.
12. Thomas & Betts Corporation.

- B. ENT: NEMA TC 13.
- C. RNC: NEMA TC 2, Type EPC-40-PVC unless otherwise indicated.
- D. LFNC: UL 1660.
- E. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.
- F. Fittings for LFNC: UL 514B.

### **2.3 OPTICAL FIBER/COMMUNICATIONS CABLE RACEWAY AND FITTINGS**

- 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. Arnco Corporation.
  2. Endot Industries Inc.
  3. IPEX Inc.
  4. Lamson & Sessions; Carlon Electrical Products.
- B. Description: Comply with UL 2024; flexible type, approved for general-use installation.

### **2.4 METAL WIREWAYS**

- 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. Cooper B-Line, Inc.
  2. Hoffman.
  3. Square D; Schneider Electric.
- B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Hinged type.
- E. Finish: Manufacturer's standard enamel finish.

**2.5 SURFACE RACEWAYS**

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by Commissioner.
1. 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:
    - a. Thomas & Betts Corporation.
    - b. Walker Systems, Inc.; Wiremold Company (The).
    - c. Wiremold Company (The); Electrical Sales Division.
- B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC with texture and color selected by Commissioner from manufacturer's standard colors.
1. 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:
    - a. Butler Manufacturing Company; Walker Division.
    - b. Enduro Systems, Inc.; Composite Products Division.
    - c. Hubbell Incorporated; Wiring Device-Kellems Division.
    - d. Lamson & Sessions; Carlon Electrical Products.
    - e. Panduit Corp.
    - f. Walker Systems, Inc.; Wiremold Company (The).
    - g. Wiremold Company (The); Electrical Sales Division.

**2.6 BOXES, ENCLOSURES, AND CABINETS**

- 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. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
  2. EGS/Appleton Electric.
  3. Erickson Electrical Equipment Company.
  4. Hoffman.
  5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
  6. O-Z/Gedney; a unit of General Signal.
  7. RACO; a Hubbell Company.
  8. Robroy Industries, Inc.; Enclosure Division.
  9. Scott Fetzer Co.; Adalet Division.
  10. Spring City Electrical Manufacturing Company.
  11. Thomas & Betts Corporation.
  12. Walker Systems, Inc.; Wiremold Company (The).
  13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

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- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.
- D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- E. Metal Floor Boxes: Cast or sheet metal, fully adjustable, rectangular.
- F. Nonmetallic Floor Boxes: Nonadjustable, round.
- G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- H. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- I. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
  - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- J. Cabinets:
  - 1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
  - 2. Hinged door in front cover with flush latch and concealed hinge.
  - 3. Key latch to match panelboards.
  - 4. Metal barriers to separate wiring of different systems and voltage.
  - 5. Accessory feet where required for freestanding equipment.

### **2.7 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING**

- A. Description: Comply with SCTE 77.
  - 1. Color of Frame and Cover: Gray.
  - 2. Configuration: Units shall be designed for flush burial and have open bottom, unless otherwise indicated.
  - 3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
  - 4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
  - 5. Cover Legend: Molded lettering, "ELECTRIC."
  - 6. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

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- B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or a combination of the two.

1. 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:

- a. Armorcast Products Company.
- b. Carson Industries LLC.
- c. CDR Systems Corporation.
- d. NewBasis.

### 2.8 SLEEVES FOR RACEWAYS

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

### 2.9 SLEEVE SEALS

- 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. Advance Products & Systems, Inc.
  2. Calpico, Inc.
  3. Metraflex Co.
  4. Pipeline Seal and Insulator, Inc.
- B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
1. Sealing Elements: NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
  2. Pressure Plates: Stainless steel. Include two for each sealing element.
  3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

**2.10 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES**

- A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
  - 1. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
  - 2. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

**PART 3 - EXECUTION**

**3.1 RACEWAY APPLICATION**

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
  - 1. Exposed Conduit: Rigid steel conduit.
  - 2. Concealed Conduit, Aboveground: Rigid steel conduit.
  - 3. Underground Conduit: RNC, Type EPC-80-PVC, direct buried.
  - 4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
  - 5. Application of Handholes and Boxes for Underground Wiring:
    - a. Handholes and Pull Boxes in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 structural load rating.
    - b. Handholes and Pull Boxes in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Polymer-concrete units, SCTE 77, Tier 8 structural load rating.
    - c. Handholes and Pull Boxes Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf (13 345-N) vertical loading.
- B. Comply with the following indoor applications, unless otherwise indicated:
  - 1. Exposed, Not Subject to Physical Damage: EMT.
  - 2. Exposed, Not Subject to Severe Physical Damage: EMT].
  - 3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:
    - a. Loading dock.
    - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    - c. Mechanical rooms.



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4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
  5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
  6. Damp or Wet Locations: Rigid steel conduit.
  7. Raceways for Optical Fiber or Communications Cable in Spaces Used for Environmental Air: empty EMT with drag wire , unless otherwise indicated by associated drawings.
  8. Raceways for Optical Fiber or Communications Cable Risers in Vertical Shafts: EMT with drag wire , unless otherwise indicated by associated drawings.
  9. Raceways for Concealed General Purpose Distribution of Optical Fiber or Communications Cable: EMT with drag wire , unless otherwise indicated by associated drawings.
  10. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.
- C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
  2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.
- E. Install empty nonferrous conduit or tubing with drag wire as directed by associated trade(s) unless otherwise indicated on associated drawings for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
- F. Do not install aluminum conduits.

### 3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."
- E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

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- F. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- G. Raceways Embedded in Slabs:
  - 1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
  - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
  - 3. Change from ENT to RNC, Type EPC-40-PVC, rigid steel conduit, or IMC before rising above the floor.
- H. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- I. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- J. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.
- K. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:
  - 1. 3/4-Inch (19-mm) Trade Size and Smaller: Install raceways in maximum lengths of 50 feet (15 m).
  - 2. 1-Inch (25-mm) Trade Size and Larger: Install raceways in maximum lengths of 75 feet (23 m).
  - 3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.
- L. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F (17 deg C), and that has straight-run length that exceeds 25 feet (7.6 m).
  - 1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:
    - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
    - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.

- c. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F (70 deg C).
- 2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change.
- 3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.
- M. Flexible Conduit Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
  - 1. Use LFMC in damp or wet locations subject to severe physical damage.
  - 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- N. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.
- O. Set metal floor boxes level and flush with finished floor surface.
- P. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

### 3.3 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
  - 1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31 Section "Earthwork" for pipe less than 6 inches (150 mm) in nominal diameter.
  - 2. Install backfill as specified in Division 31 Section "Earthwork."
  - 3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earthwork."
  - 4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
    - a. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of

equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

5. **Warning Planks:** Bury warning planks approximately 12 inches (300 mm) above direct-buried conduits, placing them 24 inches (600 mm) o.c. Align planks along the width and along the centerline of conduit.

### **3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES**

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
- C. **Elevation:** In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.
- D. Install handholes and boxes with bottom below the frost line below grade.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.

### **3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS**

- A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."
- B. **Concrete Slabs and Walls:** Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. **Rectangular Sleeve Minimum Metal Thickness:**
  1. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side greater than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
  2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches (1270 mm) and 1 or more sides equal to, or greater than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

- E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- F. Cut sleeves to length for mounting flush with both surfaces of walls.
- G. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.
- H. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway unless sleeve seal is to be installed.
- I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.
- J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.
- K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Comply with Division 07 Section "Penetration Firestopping."
- L. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.
- M. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- N. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway and sleeve for installing mechanical sleeve seals.

### 3.6 SLEEVE-SEAL INSTALLATION

- A. Install to seal underground, exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

### 3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and

installation requirements are specified in Division 07 Section "Penetration Firestopping."

**3.8 PROTECTION**

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
  - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

**END OF SECTION**

**SECTION 260553**

**IDENTIFICATION FOR ELECTRICAL SYSTEMS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

**1.3 SUBMITTALS**

- A. Product Data: For each electrical identification product indicated.
- B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.
- C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

**1.4 QUALITY ASSURANCE**

- A. Comply with ANSI A13.1.
- B. Comply with NYC Electric Code NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

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- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

### **1.5 COORDINATION**

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

## **PART 2 - PRODUCTS**

### **2.1 POWER RACEWAY IDENTIFICATION MATERIALS**

- A. Colors for Raceways Carrying Circuits at 600 V or Less:
  - 1. Black letters on an orange field.
  - 2. Legend: Indicate voltage.
- B. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
  - 1. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

### **2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS**

- A. Colors for Raceways Carrying Circuits at 600 V and Less:
  - 1. Black letters on an orange field.
  - 2. Legend: Indicate voltage.



- B. Colors for Raceways Carrying Circuits at More Than 600 V:
  - 1. Black letters on an orange field.
  - 2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- (75-mm-) high letters on 20-inch (500-mm) centers.
- C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

## 2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
  - 1. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

## 2.4 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- E. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

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- F. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
  - 1. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

### **2.5 FLOOR MARKING TAPE**

- A. 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

### **2.6 UNDERGROUND-LINE WARNING TAPE**

- A. Tape:
  - 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
  - 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
  - 3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.
- B. Color and Printing:
  - 1. Comply with ANSI Z535.1 through ANSI Z535.5.
  - 2. Inscriptions for Red-Colored Tapes: **ELECTRIC LINE, HIGH VOLTAGE.**
  - 3. Inscriptions for Orange-Colored Tapes: **TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.**

### **2.7 WARNING LABELS AND SIGNS**

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
- C. Warning label and sign shall include, but are not limited to, the following legends:
  - 1. Multiple Power Source Warning: **"DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."**
  - 2. Workspace Clearance Warning: **"WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."**

## **2.8 INSTRUCTION SIGNS**

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.
  - 1. Engraved legend with black letters on white face.
  - 2. Punched or drilled for mechanical fasteners.
  - 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.
- B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).
- C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

## **2.9 EQUIPMENT IDENTIFICATION LABELS**

- A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).
- B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.
- C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).
- D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).
- E. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm).

## **2.10 CABLE TIES**

- A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
  - 1. Minimum Width: 3/16 inch (5 mm).
  - 2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).

3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black except where used for color-coding.

**B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.**

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black.

**C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.**

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 7000 psi (48.2 MPa).
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
5. Color: Black.

**2.11 MISCELLANEOUS IDENTIFICATION PRODUCTS**

- A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

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- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- G. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
  - 1. Outdoors: UV-stabilized nylon.
  - 2. In Spaces Handling Environmental Air: Plenum rated.
- I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches (400 mm) overall.
- J. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

### 3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30A, and 120V to ground: Identify with self-adhesive vinyl label. Install labels at 10-foot (3-m) maximum intervals.
- B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
  - 1. Emergency Power.
  - 2. Power.
  - 3. UPS.
- C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
  - 1. Color-Coding for Phase Identification, 600 V or Less: Use colors listed below for ungrounded service and feeder conductors.

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- a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
  - b. Colors for 208/120-V Circuits:
    - 1) Phase A: Black.
    - 2) Phase B: Red.
    - 3) Phase C: Blue.
  - c. Colors for 480/277-V Circuits:
    - 1) Phase A: Brown.
    - 2) Phase B: Orange.
    - 3) Phase C: Yellow.
  - d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- E. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
- F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
  - 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
  - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- G. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
- 1. Limit use of underground-line warning tape to direct-buried cables.
  - 2. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- H. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

- I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
  1. Comply with 29 CFR 1910.145.
  2. Identify system voltage with black letters on an orange background.
  3. Apply to exterior of door, cover, or other access.
  4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
    - a. Power transfer switches.
    - b. Controls with external control power connections.
- J. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- K. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer.
- L. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
  1. Labeling Instructions:
    - a. Indoor Equipment: Adhesive film label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
    - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
    - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
    - d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
  2. Equipment to Be Labeled:
    - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be self-adhesive, engraved, laminated acrylic or melamine label.
    - b. Enclosures and electrical cabinets.

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- c. Access doors and panels for concealed electrical items.
- d. Switchgear.
- e. Switchboards.
- f. Emergency system boxes and enclosures.
- g. Enclosed switches.
- h. Enclosed circuit breakers.
- i. Enclosed controllers.
- j. Power transfer equipment.
- k. Contactors.
- l. Remote-controlled switches, dimmer modules, and control devices.
- m. Power-generating units.
- n. Monitoring and control equipment.

END OF SECTION



**SECTION 262413**

**SWITCHBOARDS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section Includes:

1. Service and distribution switchboards rated 600 V and less.
2. Transient voltage suppression devices.
3. Disconnecting and overcurrent protective devices.
4. Instrumentation.
5. Control power.
6. Accessory components and features.
7. Identification.

**1.3 SUBMITTALS**

- A. Product Data: For each type of switchboard, overcurrent protective device, transient voltage suppression device, ground-fault protector, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
- B. Shop Drawings: For each switchboard and related equipment.
  1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
  2. Detail enclosure types for types other than NEMA 250, Type 1.
  3. Detail bus configuration, current, and voltage ratings.
  4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
  5. Detail utility company's metering provisions with indication of approval by utility company.
  6. Include evidence of NRTL listing for series rating of installed devices.
  7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

8. Include schematic and wiring diagrams for power, signal, and control wiring.
- C. Qualification Data: For qualified installer or testing agency.
  1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- D. Field Quality-Control Reports:
  1. Test procedures used.
  2. Test results that comply with requirements.
  3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- E. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals. Manuals shall include the following:
  1. Routine maintenance requirements for switchboards and all installed components.
  2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
  3. Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graph paper; include selectable ranges for each type of overcurrent protective device.

#### **1.4 QUALITY ASSURANCE**

- A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.
- B. Testing Agency Qualifications: Member company of NETA or an NRTL.
  1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- C. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

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- F. Comply with NEMA PB 2.
- G. Comply with NYC Electric Code NFPA 70.
- H. Comply with UL 891.

### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver switchboards in sections or lengths that can be moved past obstructions in delivery path.
- B. Handle and prepare switchboards for installation according to NECA 400 or NEMA PB 2.1.

### **1.6 PROJECT CONDITIONS**

- A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.
- B. Environmental Limitations:
  - 1. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
  - 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
    - a. Ambient Temperature: Not exceeding 104 deg F (40 deg C).
    - b. Altitude: Not exceeding 6600 feet (2000 m).
- C. Service Conditions: NEMA PB 2, usual service conditions, as follows:
  - 1. Ambient temperatures within limits specified.
- D. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by City of New York or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
  - 1. Notify Commissioner no fewer than ten days in advance of proposed interruption of electric service.
  - 2. Indicate method of providing temporary electric service.
  - 3. Do not proceed with interruption of electric service without Commissioner's written permission.
  - 4. Comply with NFPA 70E.

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### **1.7 COORDINATION**

- A. Coordinate layout and installation of switchboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

### **1.8 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Five years from date of Substantial Completion.

### **1.9 EXTRA MATERIALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Potential Transformer Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
  - 2. Control-Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
  - 3. Fuses and Fusible Devices for Fused Circuit Breakers: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
  - 4. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
  - 5. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
  - 6. Indicating Lights: Equal to 10 percent of quantity installed for each size and type, but no fewer than one of each size and type.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURED UNITS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

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1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  3. Siemens Energy & Automation, Inc.
  4. Square D; a brand of Schneider Electric.
- B. Front-Connected, Front-Accessible Switchboards:
1. Main Devices: Panel or fixed, individually mounted.
  2. Branch Devices: Panel mounted.
  3. Sections front and rear aligned.
- C. Front- and Side-Accessible Switchboards:
1. Main Devices: Fixed, individually mounted.
  2. Branch Devices: Panel mounted.
  3. Sections front and rear aligned.
- D. Nominal System Voltage: 208Y/120 V.
- E. Main-Bus Continuous: 2000A.
- F. Indoor Enclosures: Steel, NEMA 250, Type 1.
- G. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.
- H. Barriers: Between adjacent switchboard sections.
- I. Insulation and isolation for main and vertical buses of feeder sections.
- J. Utility Metering Compartment: Fabricated, barrier compartment and section complying with utility company's requirements; hinged sealed door; buses provisioned for mounting utility company's current transformers and potential transformers or potential taps as required by utility company. If separate vertical section is required for utility metering, match and align with basic switchboard. Provide service entrance label and necessary applicable service entrance features.
- K. Customer Metering Compartment: A separate customer metering compartment and section with front hinged door, for indicated metering, and current transformers for each meter. Current transformer secondary wiring shall be terminated on shorting-type terminal blocks. Include potential transformers having primary and secondary fuses with disconnecting means and secondary wiring terminated on terminal blocks if necessary.
- L. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.
- M. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.

**N. Pull Box on Top of Switchboard:**

1. Adequate ventilation to maintain temperature in pull box within same limits as switchboard.
2. Removable covers shall form top, front, and sides. Top covers at rear shall be easily removable for drilling and cutting.
3. Bottom shall be insulating, fire-resistive material with separate holes for cable drops into switchboard.
4. Cable supports shall be arranged to facilitate cabling and adequate to support cables indicated, including those for future installation.

**O. Buses and Connections: Three phase, four wire unless otherwise indicated.**

1. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity, with tin-plated aluminum or copper feeder circuit-breaker line connections.
2. Ground Bus: 1/4-by-2-inch- (6-by-50-mm-) hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit ground conductors. For busway feeders, extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.
3. Main Phase Buses and Equipment Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
4. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.
5. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.

**P. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.**

**2.2 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES**

**A. Bolted-Pressure Contact Switch: Operating mechanism uses rotary-mechanical-bolting action to produce and maintain high clamping pressure on the switch blade after it engages the stationary contacts.**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Boltswitch, Inc.
  - b. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  - c. Pringle Electrical Manufacturing Company, Inc.
  - d. Siemens Energy & Automation, Inc.
  - e. Square D; a brand of Schneider Electric.
2. Main-Contact Interrupting Capability: Minimum of 12 times the switch current rating.
3. Operating Mechanism: Manual handle operation to close switch; stores energy in mechanism for opening and closing.

- a. Electrical Trip: Operation of lever or push-button trip switch, or trip signal from ground-fault relay or remote-control device, causes switch to open.
- 4. Auxiliary Switches: Factory installed, single pole, double throw, with leads connected to terminal block, and including one set more than quantity required for functional performance indicated.
- 5. Service-Rated Switches: Labeled for use as service equipment.
- 6. Ground-Fault Relay: Comply with UL 1053; self-powered type with mechanical ground-fault indicator, test function, tripping relay with internal memory, and three-phase current transformer/sensor.
- 7. Open-Fuse Trip Device: Arranged to trip switch open if a phase fuse opens.
- B. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
- C. Fuses are specified in Division 26 Section "Fuses."

### 2.3 INSTRUMENTATION

- A. Instrument Transformers: IEEE C57.13, NEMA EI 21.1, and the following:
  - 1. Potential Transformers: IEEE C57.13; 120 V, 60 Hz, single secondary; disconnecting type with integral fuse mountings. Burden and accuracy shall be consistent with connected metering and relay devices.
  - 2. Current Transformers: IEEE C57.13; 5 A, 60 Hz, secondary; wound type; single secondary winding and secondary shorting device. Burden and accuracy shall be consistent with connected metering and relay devices.
  - 3. Control-Power Transformers: Dry type, mounted in separate compartments for units larger than 3 kVA.
  - 4. Current Transformers for Neutral and Ground-Fault Current Sensing: Connect secondary wiring to ground overcurrent relays, via shorting terminals, to provide selective tripping of main and tie circuit breaker. Coordinate with feeder circuit-breaker, ground-fault protection.
- B. Ammeters, Voltmeters, and Power-Factor Meters: ANSI C39.1.
  - 1. Meters: 4-inch (100-mm) diameter or 6 inches (150 mm) square, flush or semiflush, with antiparallax 250-degree scales and external zero adjustment.
  - 2. Voltmeters: Cover an expanded-scale range of nominal voltage plus 10 percent.
- C. Instrument Switches: Rotary type with off position.
  - 1. Voltmeter Switches: Permit reading of all phase-to-phase voltages and, where a neutral is indicated, phase-to-neutral voltages.
  - 2. Ammeter Switches: Permit reading of current in each phase and maintain current-transformer secondaries in a closed-circuit condition at all times.

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- D. Feeder Ammeters: 2-1/2-inch (64-mm) minimum size with 90- or 120-degree scale. Meter and transfer device with off position, located on overcurrent device door for indicated feeder circuits only.
- E. Watt-Hour Meters and Wattmeters:
  - 1. Comply with ANSI C12.1.
  - 2. Three-phase induction type with two stators, each with current and potential coil, rated 5 A, 120 V, 60 Hz.
  - 3. Suitable for connection to three- and four-wire circuits.
  - 4. Potential indicating lamps.
  - 5. Adjustments for light and full load, phase balance, and power factor.
  - 6. Four-dial clock register.
  - 7. Integral demand indicator.
  - 8. Ratchets to prevent reverse rotation.
  - 9. Removable meter with drawout test plug.
  - 10. Semiflush mounted case with matching cover.
  - 11. Appropriate multiplier tag.

### **2.4 CONTROL POWER**

- A. Control Circuits: 120-V ac (or as indicated by manufacturer) supplied through secondary disconnecting devices from control-power transformer or from remote branch circuit.
- B. Electrically Interlocked Main and Tie Circuit Breakers: Two control-power transformers in separate compartments, with interlocking relays, connected to the primary side of each control-power transformer at the line side of the associated main circuit breaker. 120-V secondaries connected through automatic transfer relays to ensure a fail-safe automatic transfer scheme.
- C. Control-Power Fuses: Primary and secondary fuses for current-limiting and overload protection of transformer and fuses for protection of control circuits.
- D. Control Wiring: Factory installed, with bundling, lacing, and protection included. Provide flexible conductors for No. 8 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping units.

### **2.5 ACCESSORY COMPONENTS AND FEATURES**

- A. Spare-Fuse Cabinet: Suitably identified, wall-mounted, lockable, compartmented steel box or cabinet. Arrange for wall mounting.



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### **2.6 IDENTIFICATION**

- A. Mimic Bus: Continuously integrated mimic bus factory applied to front of switchboard. Arrange in single-line diagram format, using symbols and letter designations consistent with final mimic-bus diagram.
- B. Coordinate mimic-bus segments with devices in switchboard sections to which they are applied. Produce a concise visual presentation of principal switchboard components and connections.
- C. Presentation Media: Painted graphics in color contrasting with background color to represent bus and components, complete with lettered designations.
- D. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Receive, inspect, handle, and store switchboards according to NECA 400 and/or NEMA PB 2.1.
- B. Examine switchboards before installation. Reject switchboards that are moisture damaged or physically damaged.
- C. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. Install switchboards and accessories according to NECA 400 and/or NEMA PB 2.1.
- B. Equipment Mounting: Install switchboards on concrete base, 4-inch (100-mm) nominal thickness. Comply with requirements for concrete base specified in Division 03.
  - 1. 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.
  - 2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
  - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 4. Install anchor bolts to elevations required for proper attachment to switchboards.

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- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.
- D. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.
- E. Install filler plates in unused spaces of panel-mounted sections.
- F. Install overcurrent protective devices, transient voltage suppression devices, and instrumentation.
  - 1. Set field-adjustable switch trip ranges.
- G. Install spare-fuse cabinet.
- H. Comply with NECA 1.

### **3.3 IDENTIFICATION**

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

### **3.4 FIELD QUALITY CONTROL**

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

**D. Acceptance Testing Preparation:**

1. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

**E. Tests and Inspections:**

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:
  - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switchboard. Remove front panels so joints and connections are accessible to portable scanner.
  - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switchboard 11 months after date of Substantial Completion.
  - c. Instruments and Equipment:
    - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

**F. Switchboard will be considered defective if it does not pass tests and inspections.**

**G. Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.**

**3.5 ADJUSTING**

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.**

**3.6 PROTECTION**

- A. Temporary Heating: Apply temporary heat, to maintain temperature according to manufacturer's written instructions, until switchboard is ready to be energized and placed into service.**

**3.7 DEMONSTRATION**

- A. Train City of New York's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories.

**END OF SECTION**

**SECTION 262415**

**INSTRUMENTATION AND CONTROL**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

The Contractor shall furnish all labor, materials, tools, and equipment, and install all instrumentation and controls associated with all new or upgraded Petroleum systems as required by the Contract Drawings.

The Contractor shall furnish, install and test all emergency systems included on the Contract Drawings including the emergency electrical disconnect and emergency telephone systems located adjacent to the Monitoring Building. The work shall include all equipment, conductors, conduit, etc. for fully functioning systems.

**1.02 APPLICABLE STANDARDS**

All instrumentation and control equipment shall comply with the following standards and all other applicable federal, state, and New York City Building Codes including revisions to the date of Contract.

NFPA	National Fire Protection Association
ANSI	American National Standards Institute
ASTM	American Society of Testing Materials
ASME	American Society of Mechanical Engineers
NEC	National Electric Code
ISA	Instrumentation Society of America
NEMA	National Electrical Manufacturers Association

**1.03 SUBMITTALS**

**A. Shop Drawings:**

1. Wiring and schematic diagrams and any other details required to demonstrate that the system has been coordinated and will function properly as a unit.
2. Equipment and instrument list, including size, input/output types, expected range of operation, utility requirements, and materials of construction. A Bill of Materials also shall be included and keyed to the drawings. The Bill of Materials shall provide sufficient information to determine compliance with the Contract Drawings and Specifications.
3. Drawings showing the proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of work, including clearances for maintenance and operation.
4. Manufacturers' descriptive and technical literature, including catalog cuts.

5. Legends for name plates.
  6. Equipment certifications and test reports.
  7. Control panel and enclosure drawings providing arrangements, dimensions, cabinet door swing radius and terminations for all panels.
- B. Operating and maintenance instructions shall be provided for each different type of control, instrument, and system.
1. The Contractor shall furnish to the Construction Manager three (3) complete copies of the operating instructions outlining the procedures required for equipment and system start-up, operation, and shut-down. The instructions shall include the manufacturer's name, model number, service manual, parts list, and a brief description of all equipment and their basic operating features.
  2. The Contractor shall furnish to the Construction Manager three (3) complete copies of maintenance instructions listing routine maintenance procedures, possible breakdown and repairs, and troubleshooting guide.
- C. Performance Test Reports: Upon completion and testing of the installed system, test reports shall be submitted in booklet form showing that all field tests are performed to adjust each component and that all field tests are performed to prove compliance with the specified performance criteria. Each test report shall indicate the final position of the controls.

#### **1.04 MANUFACTURER'S SERVICES**

- A. The Contractor shall provide the services of a manufacturer's representative who is experienced in the installation, adjustment, and operation of the instruments and controls specified shall be provided. The representative shall supervise the installation, adjustment, and testing of the equipment.
- B. The leak detection/inventory control system shall include a minimum five-year extended service contract for the entire system that includes on-site replacement of parts, programming, and testing of system features. The extended service contract shall be between the manufacturer's authorized service and the facility. The extended service contract shall be between the manufacturer's authorized service contractor (a third party) and the City. The contractor shall obtain this extended service contract and shall submit it to the Construction Manager at substantial completion. Unit shall be furnished with a minimum of the following:
1. VGA LCD 7.4 inch touch screen
  2. Total Access software for PC or PDA
  3. 3 year back up reports for alarms, compliance, inventory and level readings
  4. Automatic reconciliation
  5. Accu Chart II software program
  6. Ethernet TCP/IP
  7. One fax modem

8. BIR and CSLD software
9. PPLD electronic leak detection
10. BIR LVDIM 12 inputs factory installed
11. BIR MDIM 12 inputs factory installed
12. Phase separation float kit (GASOLINE ONLY)
13. Fuel Density Probes for diesel and motor oil
14. One (1) 4-20millimap communication package
15. Two (2) 5 dry contact module
16. Networked Command Center allowing web browser for PC and PDA
17. Consolidated monthly reports on all tanks, lines and sensors
18. Remote monitoring for all sites
19. A tank test performance guarantee for all USTS
20. Alarm response 24 hours a day 7 days a week
21. Code Official's report with 5 year alarm history
22. 5 year Fuel Management Services for the owner
23. Site Specific wiring diagram by Engineering Consultant
24. Notifies detailed personnel according to alarm condition and type
  - a. Archives alarm reports continuously
  - b. Allow instant access to consolidated alarm history
  - c. Allows protocol for each individual alarm

#### 1.05 FIELD TRAINING

The Contractor shall provide a field training course for the Construction Manager and on-site designated operating staff. Training shall be provided for a total of 24 hours of normal working time, and shall be completed prior to the system's final acceptance by the Construction Manager and on-site designated operating staff. Field training shall cover all of the items contained in the operating and maintenance manuals.

### PART 2 - PRODUCTS

#### 2.01 GENERAL

The general instrumentation requirements are identified on the Contract Drawings. All instruments and control equipment shall conform with the following general provisions.

- A. All equipment in a system shall be compatible in function and appearance. Provisions shall be made, where necessary, for signal dampening to suppress noise and spurious electrical signals in order to provide the desired degree of performance.
- B. All instrument supports and interconnecting wiring and conduit shall be as recommended by the manufacturer and approved by the Construction Manager.
- C. Identifying tag number for each instrument shall be permanently etched or embossed onto a durable tag which shall be fastened to the device housing with stainless steel rivets or self-tapping, stainless-steel screws of appropriate size. Where neither of the above fastening can be accomplished, tag number nameplates shall be permanently attached to the device by a circlet of stainless-steel wire.

- D. All instruments and devices furnished under this Section requiring electrical power shall be suitable for operation on a 120 Volt  $\pm 10\%$ , 60 Hertz  $\pm 2$  Hertz supply.
- E. All instruments shall return to accurate measurement upon restoration of power after a power failure.
- F. Unless otherwise noted, all instruments in contact with a process stream shall be furnished with diaphragm seals.
- G. Instruments shall be guaranteed to maintain the characteristics listed herein and under conditions listed and shall meet the following specifications, except where otherwise noted:
  - 1. Accuracy:  $\pm 1\%$  of span
  - 2. Repeatability:  $\pm 0.1\%$  of span
  - 3. Dead Band:  $\pm 1\%$  of span (where applicable) in accordance with ISA Standard S50.1
  - 4. All signal generators and transmitters shall be capable of operating at a load of 600 ohm in accordance with ISA Standard S50.1, higher when specified. Signals shall be output isolated.
  - 5. All electronic instruments shall be solid-state and shall be capable of operating throughout the temperature range of 10 degrees Fahrenheit to 110 degrees Fahrenheit, unless otherwise specified.
  - 6. Temperature effect on calibration shall be not more than 1% over a temperature change of 100 degrees Fahrenheit.
- H. The ranges and scales shall be as per specified, shown on the Contract Drawings, or approved by the Construction Manager.
- I. Where separate measuring elements and transmitters are required, they shall be fully matched and any special cables or equipment required must be supplied for installation.
- J. The Contractor shall be responsible for the matching of electrical characteristics of instruments and shall supply transmitters with ample signal output capacity. Additional signal generators or repeaters shall be avoided if possible, but must be supplied if necessary.
- K. All equipment, unless otherwise specified, shall be furnished in the manufacturer's standard enclosure for the service indicated by the equipment location.
- L. All miscellaneous necessary work required to complete installation shall be included. This work includes, but is not limited to, bolts, nuts, studs, gaskets, pipe tapping, holes through walls, and repair.



- M. Electrical control conductors shall be No. 14 AWG or larger. Conductors larger than No. 14 shall be used where herein specified, or where indicated on the Contract Drawings.
- N. The size of the conductors and other current-carrying parts of switches and control equipment shall be ample for the rating of the devices to which they are to be connected for service, without undue heating. In no case shall the current density exceed 1,000 amperes per square inch of cross-section. At contacts, the current density shall not exceed 150 amperes per square inch.

**2.02 LEAK DETECTION/INVENTORY CONTROL SYSTEM**

- A. The leak detection/inventory control system shall include all parts, equipment, and software necessary for a complete system. All software, firmware, and hardware shall be of the latest revisions at the time of contract signing and/or requisition placement. The leak detection/inventory control system shall include, but not be limited to the following:
  - 1. One (1) monitoring head/system controller
  - 2. One (1) magnetostrictive technology type, inventory control and in-tank leak testing probe assembly (per tank, as required)
  - 3. One (1) annular space liquid sensing probe for interstitial space (per double-wall tank, as required)
  - 4. One (1) magnetostrictive liquid sensing probe for manway sump/dispenser pan (per sump, as required)
  - 5. One (1) overfill alarm with acknowledgment switch (per tank, as required)
  - 6. One (1) pulser/totalizer for dispenser (per hose assembly, as required)
  - 7. One (1) stick gauge calibrated in inches (per tank)
- B. The controller shall be capable of performing in-tank leak detection functions, business inventory reconciliation (BIR) functions, automatic tank calibration and charting, and external leak detection functions. The controller shall be completely compatible with all probes, sensors, and dispensers. The controller shall have LCD light groups identifying inventory, system status, setup, and diagnostics. The controller shall be supplied with an integral printer. The controller shall be supplied with an internal telephone fax/modem/dialer for the dedicated use of a card reader system. The fax/modem shall be capable of dialing a pre-programmed telephone number at operator specified alarm or inventory conditions. The controller shall include all software and interface modules required for probes, sensors, dispensers, alarms, modems, and other input/output devices required for a complete system. The controller shall be a model TLS-450R (BIR) Monitoring Head/System Controller with Integral Printer, Model 848290-122, with SiteFax Fax/Modem Interface Module, Model No. 330149-002, as manufactured by Veeder-Root, of Simsbury, Connecticut, or approved equal.
- C. The inventory control and in-tank testing probe assembly shall be of the magnetostrictive technology type. The in-tank probe shall be capable of measuring product level in the

tank in inches, and detecting the presence of water in the tank. The probe shall be capable of performing the 0.1 gallon per hour volumetric tank tightness testing and 0.2 gallon per hour automatic tank gauging in the tank system. The probe shall meet NEC, NFPA, and UL requirements for hazardous locations. Probe electronics shall be capable of operating from -40° Celsius to +50° Celsius. The in-tank probe assembly shall include 4-inch floats and 4-inch sealed riser cap and ring. Each probe shall be completely compatible with the fluid to be stored in the tank. The probe shall be Series 846390 MAG Plus Magnetostrictive Probe with 4-inch Float Kit, Model No. 846400, as manufactured by Veeder-Root, of Simsbury, Connecticut, or approved equal. The probe assembly shall also include Magnetostrictive Probe Installation Kit and Riser Cap and Ring Kit as manufactured by Veeder-Root, of Simsbury, Connecticut, or approved equal. Controller shall be equipped with a Four-Input Probe Interface Module, as manufactured by Veeder-Root, of Simsbury, Connecticut, or approved equal.

- D. The annular space liquid sensing probe shall be capable of detecting and differentiating between liquid hydrocarbons and other liquids in the interstitial space between tank walls. The probe shall meet NEC, NFPA, and UL requirements for hazardous locations. Probe electronics shall be capable of operating from -20° degrees Celsius to +70° degrees Celsius. Annular space sensor shall be Series 7943 Discriminating Interstitial Sensor for Fiberglass Tanks, as manufactured by Veeder-Root, of Simsbury, Connecticut, or approved equal. Controller shall be equipped with an Eight-Input Type A Sensor Interface Module as manufactured by Veeder-Root, of Simsbury, Connecticut, or approved equal.
- E. The manway sump sensing probe shall be capable of detecting and differentiating between liquid hydrocarbons and other liquids in the manway containment sump. The probe shall meet NEC, NFPA, and UL requirements for hazardous locations, and shall be capable of withstanding the harsh environment and wide temperature ranges possible in the intended location. Containment sump sensor shall be Model 857080 Mag Sump Sensor, as manufactured by Veeder-Root, of Simsbury, Connecticut, or approved equal. Controller shall be equipped with a Six-Input Type B Sensor Interface Module, as manufactured by Veeder-Root, of Simsbury, Connecticut, or approved equal.
- F. The overfill alarm shall be the audible horn and flashing light type. The overfill alarm shall be supplied with an alarm acknowledgment switch. Alarm electronics shall be capable of operating from -40 degrees Fahrenheit to +150 degrees Fahrenheit. The alarm and acknowledgment switch shall be Series 7900 Overfill Alarm and Alarm Acknowledgment Switch, Models No. 790091-001 and 790095-001, as manufactured by Veeder-Root, of Simsbury, Connecticut, or approved equal. Controller shall be equipped with Four-Relay Output Interface Module, as manufactured by Veeder-Root, of Simsbury, Connecticut, or approved equal.
- G. The pulser/totalizer shall be capable of totalizing product flow though the hose assembly in the dispenser, and sending a signal back to the controller. The pulser/totalizer shall be capable of performing business inventory reconciliation (BIR) functions. The pulser/totalizer shall be compatible with the dispensers. The controller shall be equipped with an interface module compatible with the pulser/totalizer. The pulser/totalizer shall be Model 787491-003, Mechanical Dispenser Pulse/Totalizer, as manufactured by Veeder-Root, of Simsbury, Connecticut, or approved equal. Controller shall be equipped with Mechanical Dispenser Interface Module (DIM), Model 330250-001, as manufactured by Veeder-Root, of Simsbury, Connecticut, or approved equal.

**2.03 EMERGENCY SYSTEMS**

- A. The emergency systems shall consist of the emergency stop button and emergency telephone located on the west side of the Monitoring Building. The emergency system shall include all parts and equipment necessary for a complete system. Systems must coordinate with power and communications distribution systems located within the Monitoring Building. The emergency systems shall include, but not be limited to the following components:
1. Emergency Stop Button - The emergency stop button will signal disconnect of all power and control circuits to the diesel fuel dispenser island except for those listed as intrinsically safe. The emergency stop button shall be 800H Two Position Push-Pull/Twist Release Button manufactured by Rockwell Automation, part number 800H-FRXT6D4 or approved equal.
  2. Emergency Stop Button Enclosure - The emergency stop button enclosure shall be rated NEMA 4X and shall be 800H One Hole Weather Proof Stainless Steel (#316) Enclosure manufactured by Rockwell Automation part number 800H-1HZ4 modified to be constructed with #316 Stainless Steel and to allow conductor entry from rear of box (no conduit hole on bottom) or approved equal.
  3. Control Conductors - Minimum size conductors shall be #14 AWG THHN-THWN single conductors in minimum sized ¾-inch diameter ridged galvanized steel conduit.

**PART 3 - EXECUTION**

**3.01 GENERAL**

- A. Installation of all equipment shall be in accordance with the New York City Fire Prevention Code and the New York City Electrical codes. The Contractor shall furnish and install all required conduit sealing fittings, explosion-proof accessories, and NEMA Type 7 enclosures where indicated on the Contract Drawings, or where required by Code, or both.
- B. Instrumentation and control equipment shall be installed as indicated on the Contract Drawings or as indicated by the Construction Manager. All power and control wiring and connections not specifically indicated on the Contract Drawings, but required for the proper operation of equipment shall be made by the Contractor in accordance with these Specifications. All electrical control and instrumentation equipment installed in Class 1 hazardous locations shall be installed in NEMA Type 7 enclosures. Conduits and wireways leading to and from these areas shall be provided with sealing fittings. All non-conducting metal parts of switches and control, shall be rust-proofed by galvanizing, cadmium plating, baked enamel or by the use of a non-corroding metal. Springs, wherever used, shall be a phosphor bronze. Contacts shall close fully at a line voltage of 10% below normal.
- C. Each leak detection inventory control system shall installed, programmed and adjusted in accordance with the manufacturer's instructions so that all components function properly.

Each overfill alarm and alarm acknowledgement switch shall be programmed and adjusted so that the alarm is activated at 90 percent of the tank capacity.

- D. Provide all necessary labor and equipment to print out Veeder-Root "Accuchart" tank chart at completion of 14-day calibration process. The Contractor shall submit a minimum of three (3) charts to the Owner.

### 3.02 TESTING

- A. General: All equipment (hardware and software) shall be factory and field tested to demonstrate that it provides the specified functions.
- B. The factory and onsite test procedures shall be submitted to the Construction Manager for approval prior to starting the actual tests.
- C. The onsite testing shall include checking of cables, testing of system subassemblies and checking of connections for each component and for the entire instrumentation and control system.
- D. The Contractor shall notify the Construction Manager in writing that he is ready and desires to start the on-site system testing. The Construction Manager will authorize start of the testing at a mutually-agreed starting date.
- E. Shop Testing: All activating devices, instruments and assemblies furnished under this item shall be set up in the shop of the manufacturer and tested over the full range of the equipment. The equipment shall satisfactorily perform all the functions within the requirements of the specifications.
- F. Field Testing: All instruments and systems shall be field tested to ensure conformance with the Specifications. Control systems shall receive dynamic loop tests which shall conform to the intent of ANSI: MC4.1 (ISA-S26). The control systems and equipment shall include provisions for such testing.
- G. Input signals for equipment control shall be simulated for at least 5 signal values from 0 to 100 percent signal, with corresponding equipment response to be manually recorded, and adjustments made as required. Output signals from the equipment shall be read for at least 5 signal values from 0 to 100 percent of the meaningful process values, and adjustments shall be made as required.
- H. All instruments used for control functions shall be tested with the final elements in the circuit in addition to simulated control methods. The Contractor shall adjust instruments and/or final elements to obtain the best working conditions for a dynamic system.

### 3.03 WARRANTIES

The Contractor shall provide the following manufacturer warranties for major tank related equipment:

- Magnetostrictive probe with float – 1 year.
- Leak detection sensor – 1 year.
- Overfill alarm – 1 year.

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- Alarm acknowledgement switch – 1 year.
- Leak detection/inventory control system - 1 year.

END OF SECTION

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**SECTION 262416**

**PANELBOARDS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section Includes:
  - 1. Distribution panelboards.
  - 2. Lighting and appliance branch-circuit panelboards.

**1.3 PERFORMANCE REQUIREMENTS**

**1.4 SUBMITTALS**

- A. Product Data: For each type of panelboard, switching and overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
  - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
  - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
  - 3. Detail bus configuration, current, and voltage ratings.
  - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
  - 5. Include evidence of NRTL listing for series rating of installed devices.
  - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  - 7. Include wiring diagrams for power, signal, and control wiring.
- C. Qualification Data: For qualified testing agency.
- D. Field Quality-Control Reports:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.

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3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- E. Panelboard Schedules: For installation in new panelboards. Submit final versions after load balancing.
- F. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. Manuals shall include the following:
  1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
  2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

### **1.5 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
  1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Comply with NEMA PB 1.
- F. Comply with NYC Electric Code NFPA 70.

### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NECA 407 or NEMA PB 1.

### **1.7 PROJECT CONDITIONS**

- A. Environmental Limitations:



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1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
  2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
    - a. Ambient Temperature: Not exceeding 23 deg F (minus 5 deg C) to plus 104 deg F (plus 40 deg C).
    - b. Altitude: Not exceeding 6600 feet (2000 m).
- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
1. Ambient temperatures within limits specified.
  2. Altitude not exceeding 6600 feet (2000 m).
- C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by City of New York or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
1. Notify Commissioner no fewer than ten days in advance of proposed interruption of electric service.
  2. Do not proceed with interruption of electric service without Commissioner's written permission.
  3. Comply with NFPA 70E.
- 1.8 COORDINATION
- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- 1.9 WARRANTY
- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.
1. Warranty Period: Five years from date of Substantial Completion.

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### 1.10 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Keys: Two spares for each type of new panelboard cabinet lock.
  - 2. Circuit Breakers Including GFCI and Ground Fault Equipment Protection (GFEP) Types: Two spares for each new panelboard.
  - 3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
  - 4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- B. Enclosures: Surface-mounted cabinets.
  - 1. Rated for environmental conditions at installed location.
    - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
    - b. Outdoor Locations: NEMA 250, Type 3R.
    - c. Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
    - d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
    - e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 5.
  - 2. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
  - 3. Finishes:
    - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
    - b. Back Boxes: Same finish as panels and trim.
  - 4. Directory Card: Inside new panelboard door, mounted in metal frame with transparent protective cover.
- C. Incoming Mains Location: Top and bottom.
- D. Phase, Neutral, and Ground Buses:
  - 1. Material: Hard-drawn copper, 98 percent conductivity.
  - 2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

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- E. Conductor Connectors: Suitable for use with conductor material and sizes.
  - 1. Material: Hard-drawn copper, 98 percent conductivity.
  - 2. Main and Neutral Lugs: Compression type.
  - 3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
  - 4. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
- F. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.
- G. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- H. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, listed and labeled for series-connected short-circuit rating by an NRTL.
- I. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

### **2.2 DISTRIBUTION PANELBOARDS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  - 3. Siemens Energy & Automation, Inc.
  - 4. Square D; a brand of Schneider Electric.
- B. Panelboards: NEMA PB 1, power and feeder distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
  - 1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.
- D. Mains: Circuit breaker or lugs only.
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Plug-in or bolt-on circuit breakers.
- F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.
- G. Contactors in Main Bus: NEMA ICS 2, Class A, mechanically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.

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1. Internal Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.
2. External Control-Power Source: 120-V branch circuit or 24-V control circuit (whichever the manufacturer requires).

### **2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  3. Siemens Energy & Automation, Inc.
  4. Square D; a brand of Schneider Electric.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker or lugs only.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Contactors in Main Bus: NEMA ICS 2, Class A, mechanically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.
  1. Internal Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.
  2. External Control-Power Source: 120-V branch circuit or 24-V control circuit.
- F. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.
- G. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

### **2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  3. Siemens Energy & Automation, Inc.
  4. Square D; a brand of Schneider Electric.
- B. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
  1. Fuses, and Spare-Fuse Cabinet: Comply with requirements specified in Division 26 Section "Fuses."

2. Fused Switch Features and Accessories: Standard ampere ratings and number of poles.
3. Auxiliary Contacts: One normally open and normally closed contact(s) that operate with switch handle operation.

## 2.5 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.
- B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Receive, inspect, handle, and store panelboards according to NECA 407 and/or NEMA PB 1.1.
- B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install panelboards and accessories according to NECA 407 and/or NEMA PB 1.1.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- C. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.
- D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- E. Install overcurrent protective devices and controllers not already factory installed.
  1. Set field-adjustable, circuit-breaker trip ranges.
- F. Install filler plates in unused spaces.

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- G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
- H. Comply with NECA 1.

### **3.3 IDENTIFICATION**

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Commissioner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

### **3.4 FIELD QUALITY CONTROL**

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Acceptance Testing Preparation:
  - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
  - 2. Test continuity of each circuit.
- E. Tests and Inspections:
  - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  - 3. Perform the following infrared scan tests and inspections and prepare reports:
    - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each

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panelboard. Remove front panels so joints and connections are accessible to portable scanner.

- b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
- c. Instruments and Equipment:
  - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

F. Panelboards will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

### 3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

B. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

- 1. Measure as directed during period of normal system loading.
- 2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
- 3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
- 4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

### 3.6 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

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**SECTION 262713**  
**ELECTRICITY METERING**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section includes equipment for electricity metering by utility company.

**1.3 DEFINITIONS**

- A. KY Pulse: Term used by the metering industry to describe a method of measuring consumption of electricity that is based on a relay opening and closing in response to the rotation of the disk in the meter.

**1.4 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For electricity-metering equipment.
  - 1. Dimensioned plans and sections or elevation layouts.
  - 2. Wiring Diagrams: For power, signal, and control wiring. Identify terminals and wiring designations and color-codes to facilitate installation, operation, and maintenance. Indicate recommended types, wire sizes, and circuiting arrangements for field-installed wiring, and show circuit protection features.
- C. Field quality-control reports.

**1.5 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NYC Electric Code NFPA 70.

## **HARPER STREET YARD**

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### **1.6 PROJECT CONDITIONS**

- A. **Interruption of Existing Electrical Service:** Do not interrupt electrical service to facilities occupied by City of New York or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
  - 1. Notify Commissioner no fewer than ten days in advance of proposed interruption of electrical service.
  - 2. Do not proceed with interruption of electrical service without Commissioner's written permission.

### **1.7 COORDINATION**

- A. **Electrical Service Connections:** Coordinate with utility companies and components they furnish as follows:
  - 1. Comply with requirements of utilities providing electrical power services.
  - 2. Coordinate installation and connection of utilities and services, including provision for electricity-metering components.

## **PART 2 - PRODUCTS**

### **2.1 EQUIPMENT FOR ELECTRICITY METERING BY UTILITY COMPANY**

- A. Meters will be furnished by utility company.
- B. **Current-Transformer Cabinets:** Comply with requirements of electrical-power utility company.
- C. **Meter Sockets:** Comply with requirements of electrical-power utility company.
  - 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
    - a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
    - b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
    - c. Siemens Energy & Automation, Inc.
    - d. Square D; a brand of Schneider Electric.
  - 2. Comply with requirements of utility company for meter center.
  - 3. **Housing:** NEMA 250, Type 1 enclosure.
  - 4. **Minimum Short-Circuit Rating:** As required by the Utility Company.
  - 5. **Main Disconnect Device:** Circuit breaker, series-combination rated for use with downstream feeder and branch circuit breakers.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Comply with equipment installation requirements in NECA 1.
- B. Install meters furnished by utility company. Install raceways and equipment according to utility company's written requirements. Provide empty conduits for metering leads and extend grounding connections as required by utility company.
- C. Install modular meter center according to NECA 400 switchboard installation requirements.

**3.2 IDENTIFICATION**

- A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
  - 1. Series Combination Warning Label: Self-adhesive type, with text as required by NFPA 70.
  - 2. Equipment Identification Labels: Adhesive film labels with clear protective overlay. For residential meters, provide an additional card holder suitable for printed, weather-resistant card with occupant's name.

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**SECTION 262726**

**WIRING DEVICES**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
  - 2. Snap switches and wall-box dimmers.
  - 3. Solid-state fan speed controls.
  - 4. Floor service outlets, poke-through assemblies, service poles, and multi-outlet assemblies.
- B. Related Sections include the following:

**1.3 DEFINITIONS**

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.
- E. TVSS: Transient voltage surge suppressor.
- F. UTP: Unshielded twisted pair.

**1.4 SUBMITTALS**

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

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- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

### **1.5 QUALITY ASSURANCE**

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NYC Electric Code NFPA 70.

### **1.6 COORDINATION**

- A. Receptacles for City of New York-Furnished Equipment: Match plug configurations.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
  - 1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
  - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
  - 3. Leviton Mfg. Company Inc. (Leviton).
  - 4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).
  - 5. FireX; a Kidde Company

### **2.2 STRAIGHT BLADE RECEPTACLES**

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
  - 1. Products: Subject to compliance with requirements, provide one of the following:

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- a. Cooper; 5351 (single), 5352 (duplex).
  - b. Hubbell; HBL5351 (single), CR5352 (duplex).
  - c. Leviton; 5891 (single), 5352 (duplex).
  - d. Pass & Seymour; 5381 (single), 5352 (duplex).
- B. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
- 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; TR8300.
    - b. Hubbell; HBL8300SG.
    - c. Leviton; 8300-SGG.
    - d. Pass & Seymour; 63H.
  - 2. Description: Labeled to comply with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.

### 2.3 GFCI RECEPTACLES

- A. General Description: Straight blade, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
- 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; GF20.
    - b. Pass & Seymour; 2084.
    - c. Or approved equal.

### 2.4 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.
- B. Switches, 120/277 V, 20 A:
- 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
    - b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
    - c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
    - d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).

- C. Pilot Light Switches, 20 A:
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; 2221PL for 120 V and 277 V.
    - b. Hubbell; HPL1221PL for 120 V and 277 V.
    - c. Leviton; 1221-PLR for 120 V, 1221-7PLR for 277 V.
    - d. Pass & Seymour; PS20AC1-PLR for 120 V.
  - 2. Description: Single pole, with neon-lighted handle, illuminated when switch is "ON."
- D. Key-Operated Switches, 120/277 V, 20 A:
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; 2221L.
    - b. Hubbell; HBL1221L.
    - c. Leviton; 1221-2L.
    - d. Pass & Seymour; PS20AC1-L.
  - 2. Description: Single pole, with factory-supplied key in lieu of switch handle.
- E. Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; 1995.
    - b. Hubbell; HBL1557.
    - c. Leviton; 1257.
    - d. Pass & Seymour; 1251.
- F. Key-Operated, Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; 1995L.
    - b. Hubbell; HBL1557L.
    - c. Leviton; 1257L.
    - d. Pass & Seymour; 1251L.

## 2.5 FAN SPEED CONTROLS

- A. Modular, 120-V, full-wave, solid-state units with integral, quiet on-off switches and audible frequency and EMI/RFI filters. Comply with UL 1917.
  - 1. Continuously adjustable slider, toggle switch, or rotary knob, 5 A.
  - 2. Three-speed adjustable slider or rotary knob, 1.5 A.



**2.6 WALL PLATES**

- A. Single and combination types to match corresponding wiring devices.
  - 1. Plate-Securing Screws: Metal with head color to match plate finish.
  - 2. Material for Finished Spaces: Steel with white baked enamel, suitable for field painting.
  - 3. Material for Unfinished Spaces: Galvanized steel.
  - 4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in "wet locations."
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum with lockable cover.

**2.7 MULTIOUTLET ASSEMBLIES**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Hubbell Incorporated; Wiring Device-Kellems.
  - 2. Wiremold Company (The).
- B. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.
- C. Raceway Material: Metal, with manufacturer's standard finish.
- D. Wire: No. 12 AWG.

**2.8 FINISHES**

- A. Color: Wiring device catalog numbers in Section Text do not designate device color.
  - 1. Wiring Devices Connected to Normal Power System: As selected by the Commissioner, unless otherwise indicated or required by NFPA 70 or device listing.
  - 2. Wiring Devices Connected to Emergency Power System: Red.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

**B. Coordination with Other Trades:**

1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

**C. Conductors:**

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
  - a. Cut back and pigtail, or replace all damaged conductors.
  - b. Straighten conductors that remain and remove corrosion and foreign matter.
  - c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

**D. Device Installation:**

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

**E. Receptacle Orientation:**

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.

**F. Device Plates:** Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

**G. Dimmers:**

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

**H. Arrangement of Devices:** Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

**I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.**

**3.2 IDENTIFICATION**

**A. Comply with Division 26 Section "Identification for Electrical Systems."**

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

**3.3 FIELD QUALITY CONTROL**

**A. Perform tests and inspections and prepare test reports.**

1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
2. Test Instruments: Use instruments that comply with UL 1436.
3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

**B. Tests for Convenience Receptacles:**

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.

4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
  5. Using the test plug, verify that the device and its outlet box are securely mounted.
  6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- C. Test straight blade for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz. (115 g).

END OF SECTION

**SECTION 262813**

**FUSES**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section Includes:

1. Cartridge fuses rated 600-V ac and less for use in enclosed switches, switchboards, and fuseholders.
2. Plug fuses rated 125-V ac and less for use in plug-fuse-type enclosed switches and fuseholders.
3. Plug-fuse adapters for use in Edison-base, plug-fuse sockets.
4. Spare-fuse cabinets.

**1.3 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
  - a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
  - b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
3. Current-limitation curves for fuses with current-limiting characteristics.

- B. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. Manuals shall include the following:

1. Ambient temperature adjustment information.

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2. Current-limitation curves for fuses with current-limiting characteristics.
3. Coordination charts and tables and related data.

### **1.4 QUALITY ASSURANCE**

- A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NYC Electric Code NFPA 70.
- E. Comply with UL 248-11 for plug fuses.

### **1.5 PROJECT CONDITIONS**

- A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

### **1.6 COORDINATION**

- A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

### **1.7 EXTRA MATERIALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Cooper Bussmann, Inc.

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2. Edison Fuse, Inc.
3. Ferraz Shawmut, Inc.
4. Littelfuse, Inc.

### **2.2 CARTRIDGE FUSES**

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

### **2.3 PLUG FUSES**

- A. Characteristics: UL 248-11, nonrenewable plug fuses; 125-V ac.

### **2.4 PLUG-FUSE ADAPTERS**

- A. Characteristics: Adapters for using Type S, rejection-base plug fuses in Edison-base fuseholders or sockets; ampere ratings matching fuse ratings; irremovable once installed.

### **2.5 SPARE-FUSE CABINET**

- A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.
  1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
  2. Finish: Gray, baked enamel.
  3. Identification: "SPARE FUSES" in 1-1/2-inch- (38-mm-) high letters on exterior of door.
  4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
- B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
- C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

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- D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 FUSE APPLICATIONS**

#### **A. Cartridge Fuses:**

1. Service Entrance: Class L, fast acting.
2. Feeders: Class L, fast acting.
3. Motor Branch Circuits: Class RK1, time delay.
4. Other Branch Circuits: Class RK1, time delay.
5. Control Circuits: Class CC, fast acting.

#### **B. Plug Fuses:**

1. Motor Branch Circuits: Edison-base type, dual-element time delay.
2. Other Branch Circuits: Edison-base type, single-element fast acting.

### **3.3 INSTALLATION**

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
- B. Install plug-fuse adapters in Edison-base fuseholders and sockets. Ensure that adapters are irremovable once installed.
- C. Install spare-fuse cabinet(s).

### **3.4 IDENTIFICATION**

- A. Install labels complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

**END OF SECTION**



**SECTION 262816**

**ENCLOSED SWITCHES AND CIRCUIT BREAKERS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Receptacle switches.
4. Shunt trip switches.
5. Molded-case circuit breakers (MCCBs).
6. Molded-case switches.
7. Enclosures.

**1.3 DEFINITIONS**

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

**1.4 SUBMITTALS**

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
  1. Enclosure types and details for types other than NEMA 250, Type 1.
  2. Current and voltage ratings.
  3. Short-circuit current ratings (interrupting and withstand, as appropriate).
  4. Include evidence of NRTL listing for series rating of installed devices.

5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
  1. Wiring Diagrams: For power, signal, and control wiring.
- C. Qualification Data: For qualified testing agency.
- D. Field quality-control reports.
  1. Test procedures used.
  2. Test results that comply with requirements.
  3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- E. Manufacturer's field service report.
- F. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. Manuals shall include the following:
  1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

## 1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
  1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Comply with NYC Electric Code NFPA 70.

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### **1.6 PROJECT CONDITIONS**

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
  - 1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
- B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by City of New York or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
  - 1. Notify Commissioner no fewer than ten days in advance of proposed interruption of electric service.
  - 2. Indicate method of providing temporary electric service.
  - 3. Do not proceed with interruption of electric service without Commissioner's written permission.
  - 4. Comply with NFPA 70E.

### **1.7 COORDINATION**

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

### **1.8 EXTRA MATERIALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
  - 2. Fuse Pullers: Two for each size and type.

## **PART 2 - PRODUCTS**

### **2.1 FUSIBLE SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following:
  - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  - 3. Siemens Energy & Automation, Inc.
  - 4. Square D; a brand of Schneider Electric.

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- B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
  - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  - 3. Hookstick Handle: Allows use of a hookstick to operate the handle.
  - 4. Lugs: Mechanical type, suitable for number, size, and conductor material.
  - 5. Service-Rated Switches: Labeled for use as service equipment.

### **2.2 NONFUSIBLE SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  - 3. Siemens Energy & Automation, Inc.
  - 4. Square D; a brand of Schneider Electric.
- B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
  - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  - 3. Hookstick Handle: Allows use of a hookstick to operate the handle.
  - 4. Lugs: Mechanical type, suitable for number, size, and conductor material.

### **2.3 ENCLOSURES**

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
  - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
  - 2. Outdoor Locations: NEMA 250, Type 3R.
  - 3. Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
  - 4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.

5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 INSTALLATION**

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- C. Install fuses in fusible devices.
- D. Comply with NECA 1.

#### **3.3 IDENTIFICATION**

- A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."
  1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
  2. Label each enclosure with engraved metal or laminated-plastic nameplate.

#### **3.4 FIELD QUALITY CONTROL**

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.

1. **Manufacturer's Field Service:** Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

**D. Acceptance Testing Preparation:**

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

**E. Tests and Inspections:**

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:
  - a. **Initial Infrared Scanning:** After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
  - b. **Follow-up Infrared Scanning:** Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
  - c. **Instruments and Equipment:** Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

**F. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.**

**G. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.**

**3.5 ADJUSTING**

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.**
- B. Set field-adjustable circuit-breaker trip ranges.**

**END OF SECTION**

**SECTION 262820**  
**CONTACTOR MODULE**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section Includes:
  - 1. Contactor Modules.

**1.3 SUBMITTALS**

- A. Product Data: For the contactor module submittal, include dimensioned elevations for orientation below associated panelboard, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
  - 1. Enclosure types and details for types other than NEMA 250, Type 1.
  - 2. Current and voltage ratings.
  - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
  - 4. Include evidence of NRTL listing for series rating of installed devices.
  - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
  - 6. Wiring Diagrams: For power, signal, and control wiring.
- B. Qualification Data: For qualified testing agency.
- C. Field quality-control reports.
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- D. Manufacturer's field service report.

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- E. Operation and Maintenance Data: In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

- 1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

### **1.4 QUALITY ASSURANCE**

- A. Testing Agency's Field Supervisor: Currently certified to supervise on-site testing.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NYC Electric Code NFPA 70.

### **1.5 PROJECT CONDITIONS**

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
  - 1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
- B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by City of New York or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
  - 1. Notify Commissioner no fewer than ten days in advance of proposed interruption of electric service.
  - 2. Indicate method of providing temporary electric service.
  - 3. Do not proceed with interruption of electric service without Commissioner's written permission.

### **1.6 COORDINATION**

- A. Coordinate layout and installation of contact enclosure and associated components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.



**1.7 EXTRA MATERIALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- B. The contact enclosure shall be provided with an owner's manual providing installation and operating instructions.

**PART 2 - PRODUCTS**

**2.1 CONTACT ENCLOSURE**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. ASCO 918 (remote control switch)
  - 2. General Electric
  - 3. Eaton Corp.
  - 4. Or Approved Equal
- B. The remote control switch shall contain the following features:
  - 1. The remote control switch shall be electrically operated by a dual-acting, single-solenoid mechanism that is inherently interlocked and mechanically held in both the open and closed positions. The main contacts shall be power driven in both directions. Positive locking of contact positions shall not be dependent on gravity, hooks, latches or semi-permanent magnets.
  - 2. The remote control switch shall be capable of operating in any position. Provisions shall be incorporated for manual operation during inspection and maintenance.
  - 3. The remote control switch shall be Underwriters' Laboratories listed under UL 508. Main contacts shall be double-break, continuous-duty rated 20 amperes to 600 volts AC, 60 Hz (30 amperes to 600 volts AC, 60 Hz, for general-purpose loads and standard ballast loads), and be marked for ballast lighting, tungsten and general-purpose loads. Lighting contactors requiring derating when used in an enclosure or with tungsten lamp loads shall not be acceptable.
  - 4. The remote control switches shall be provided with clamp-type, self-rising terminal plates for solderless connection of line, load and control conductors. Terminals shall accept a wire range of #18 AWG to #10AWG CU.
  - 5. The number of poles, up to a maximum of 12, on a single remote control lighting contactor, shall be provided as indicated on the plans.
  - 6. The remote control switches shall be UL listed for the following short-circuit withstand current ratings when coordinated with a UL-listed molded case circuit breaker rated 30 amperes:

- a. 22,000 amps rms symmetrical, 250 volts, 60 Hz
- 7. The operating coil and main contacts shall be replaceable from the front without major disassembly and visual indication shall be provided for each contact.
- 8. Provisions shall be included to permit remote pilot lamp-type visual indications without the necessity for auxiliary contacts or additional wiring.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine elements and surfaces to receive contact enclosures for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 INSTALLATION**

- A. Install contact enclosure as indicated on the drawings and as required by the manufacturer.

#### **3.3 IDENTIFICATION**

- A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."
  - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
  - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

#### **3.4 FIELD QUALITY CONTROL**

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Acceptance Testing Preparation:

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1. Test insulation resistance for each contact being utilized to feed diesel pump station loads, feeders, and the feeder from the fuse cut-out bot to the contact enclosure.
  2. Test continuity of each contact circuit.
- E. Operational Testing:
1. Test that the desired circuits (as per the drawings) in the new diesel station are automatically shutdown when the "emergency stop button" (refer to drawings) is activated via each associated circuit breaker being opened.
- F. Tests and Inspections:
1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  3. Perform the following infrared scan tests and inspections and prepare reports:
    - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each contact. Remove front panels so joints and connections are accessible to portable scanner.
    - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each contact eleven (11) months after date of Substantial Completion.
    - c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
  4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- G. The contact enclosure will be considered defective if it does not pass tests and inspections.
- H. Prepare test and inspection reports, including a certified report that identifies the contact enclosure and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- 3.5 ADJUSTING
- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

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**SECTION 266510**

**FIRE ALARM WIRING DEVICES**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes the following:
  - 1. 120VAC Dual Smoke Alarm Sensor with Battery Backup.
  - 2. 120VAC Dual Mode Strobe Light.
- B. Related Sections include the following:

**1.3 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.
- C. Operation and Maintenance Data: For fire alarm/detection devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

**1.4 QUALITY ASSURANCE**

- A. Source Limitations: Obtain each type of fire alarm/detection device through one source from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined by UL217 (smoke alarm and strobe device), UL2034 (smoke alarm only), and NFPA 72 (smoke alarm and strobe device).
- C. Comply with NYC Electric Code NFPA 70.

**1.5 COORDINATION**

- A. Coordinate arrangement, mounting, and support of fire alarm wiring devices:
  - 1. To provide for ease of disconnecting/maintaining the devices with minimum interference to other installations.
  - 2. To allow right of way for piping and conduit.
  - 3. So associated conduits will be clear of obstructions and of the working and access space of other equipment.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
  - 1. Kidde.
  - 2. First Alert.
  - 3. Gentex.
  - 4. Or Approved Equal

**2.2 120VAC DUAL SMOKE ALARM SENSOR WITH BATTERY BACKUP**

- A. The smoke alarm shall be powered by a 120VAC, 60Hz, 80mA source along with a 9V battery backup.
- B. The unit shall incorporate both an ionization smoke sensor and a photoelectric smoke sensor with a nominal alarm sensitivity of 1.99%/ft.
- C. The temperature operating range shall be between 40°F and 100°F (4°C and 38°C) and the humidity operating range shall be 5% - 95% relative humidity.
- D. The unit shall provide optional tamper resistance that deters removal of the unit from the wall or ceiling.
- E. The alarm shall include a test button that will electronically simulate the presence of smoke and cause the unit to go into alarm. This sequence tests the unit's electronics, battery and horn to ensure proper operation.
- F. The unit shall include a piezoelectric horn that is rated at 85 decibels at 10 feet. In a smoke incident, the horn will sound in the repetitive manner – three (3) beeps, a pause, three (3) beeps, a pause.
- G. The unit shall include a feature that silences the unit by pressing a button. This functionality shall not exceed approximately 7 minutes if a nuisance condition occurs. The alarm shall chirp every 30-40 seconds during this time and will automatically reset after approximately 7 minutes and sound the alarm if particles of combustion are still

present. This feature shall be overridden and the unit will alarm if the smoke is too dense.

- H. The unit shall include a low battery warning utilizing a brief alarm chirp every 30-40 seconds for a minimum of seven (7) days.
- I. The alarm shall utilize a red LED that shall flash once every 30-40 seconds to indicate the alarm is receiving power.

### **2.3 120VAC Dual Mode Strobe Light**

- A. The strobe light shall be powered by a 120VAC, 60Hz source. \
- B. The temperature operation range shall be between 40°F and 100°F (4°C and 38°C).
- C. The strobe light can be installed on any standard single gang electrical box, up to a 4" octagon junction box.
- D. The electrical connection (to the device) shall be made with a plug-in connector.
- E. The device shall provide optional tamper resistance that deters removal of the unit from the wall or ceiling.
- F. This unit shall include a bright candela strobe light with a flash rate of one (1) flash per second.
- G. This unit shall be interconnected with smoke alarms.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Comply with NFPA 72.
- B. Coordination with Other Trades:
  - 1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
  - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
  - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
  - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

**D. Device Installation:**

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
6. Tighten unused terminal screws on the device.
7. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

**E. Dual Smoke Alarm Sensor With Battery Backup and Dual Mode Strobe Light:**

1. The smoke alarm can be installed on any standard single gang electrical box, up to a 4" octagon junction box. The electrical connection (to the alarm) shall be made with a plug-in connector.
2. A maximum of twenty-four (24) devices (smoke alarms and strobes) can be interconnected in a multiple station arrangement.
3. The interconnect system must not exceed the NFPA (National Fire Protection Association) limit of 18 initiation devices, of which 12 can be smoke alarms. With 18 initiation devices (smoke, heat, CO, etc.) interconnected, it is still possible to interconnect 6 strobe lights and or relay modules.

**3.2 FIELD QUALITY CONTROL**

- A. Perform tests to indicate that the strobe and local alarm are activated in simulated smoke scenario. The Commissioner must be notified if such a test fails.

**3.3 WARRANTY**

- A. Both the smoke alarm and strobe device shall include a 5-year manufacturer's limited warranty.

**END OF SECTION**



**SECTION 312000**

**FILLING, BACKFILLING AND COMPACTING FOR STRUCTURES**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

The Contractor shall furnish all labor, materials, tools and equipment required to perform all operations for filling, backfilling and compacting for structures as indicated on the Contract Drawings or as specified by the Construction Manager.

**1.02 RELATED WORK**

SECTION: EXCAVATION

**1.03 APPLICABLE REFERENCES**

The publications listed below form a part of this Specifications to extent referenced. The publications are referred to in the text by the basic designation and shall be the latest published version.

**A. American Society of Testing and Materials (ASTM):**

ASTM C 33	Specification for Concrete Aggregates
ASTM D 422	Particle-Size Analysis of Soils
ASTM D 1556	Density of Soil In Place by the Sand-Cone Method
ASTM D 1557	Moisture-Density Relations of Soils, and Soil-Aggregate Mixtures. Using 10-lb (4.54-kg) Rammer and 18-in. (457-mm) Drop
ASTM D 2487	Classification of Soils for Engineering Purposes
ASTM D 2922	Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)
ASTM D 2937	Density of Soil In Place by the Drive-Cylinder Method
ASTM D 3017	Moisture Content of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM E 548	Generic Criteria for Use in the Evaluation of Testing and Inspection Agencies

**B. American Concrete Institute**

ACI 301	Specifications for Structural Concrete for Buildings
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**1.04 SUBMITTALS**

Submittals shall include, but not be limited to, the following:

- A. Results of field density tests, together with their locations, depths and computations of Relative Compaction (RC).

#### 1.05 DEFINITIONS

The term FILL or FILLING shall be understood to mean placement of any soil, stone or fractured rock materials for either new fills or for backfills which replace materials previously removed during construction. This will refer to fills which are placed to support all permanent structures, underground tanks, pavements, slabs, walkways, fills which are placed within five feet of building walls, or as indicated in the Contract Drawings.

- A. Satisfactory Materials: Satisfactory materials shall consist of any material classified by ASTM D 2487 as GW, GP, GM, SP, SM, and SW.
- B. Unsatisfactory Materials: Unsatisfactory materials shall be materials that do not comply with the requirements for satisfactory materials. Unsatisfactory materials include but are not limited to those materials containing roots and other organic matter, trash, debris, frozen materials and stones larger than 4 inches, and materials classified in ASTM D 2487, as PT, OH, and OL.
- C. Cohesionless and Cohesive Materials: Cohesionless materials shall include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic.
- D. Unyielding Material: Unyielding material shall consist of rock and gravelly soils with stones greater than 4 inches in any dimension or as defined by the pipe manufacturer, whichever is smaller.
- E. Unstable Material: Unstable material shall consist of materials too wet to properly support the pipe, conduit, or appurtenant structure as determine by the Construction Manager.

#### 1.06 DESCRIPTION

Filling shall include all procedures required to fill all excavations required for the project to the lines and grades indicated in the Contract Drawings, or as specified by the Construction Manager.

#### 1.07 TESTING

A representative of NYCDDC will conduct the required testing.

### PART 2 - PRODUCTS

#### 2.01 QUALITY OF MATERIAL FOR FILLS

- A. Materials used for fills shall consist of approved suitable soils including mixtures of sands, gravels, crushed stone or crushed gravel, and must be free from any perishable, organic or other extraneous matter of any kind.

- B. Any solid materials, such as stones, boulders, cobbles, rock fragments or broken masonry, which are of a size and type which, in the opinion of the Construction Manager, will interfere with the proper installation of, or have an adverse impact upon, any surface or subsurface structures and/or appurtenances, or will prevent the proper compaction of the fill, will not be allowed.
- C. Any previously excavated surface materials crushed for use as a fill material may be used for filling purposes, providing that the materials is shown to satisfy all the criteria of this Specification for naturally produced materials, including material hardness and durability properties. In addition, it must be shown that these properties do not change with time in the fill. In particular, if the Construction Manager so directs, it must be shown that any of the material (such as crushed stone) does not become impervious by rehydration in the fill and prevent natural water drainage through the fill.
- D. In no case shall any solid materials be allowed to collect and remain in layers or clusters, but shall be distributed and separated by finer materials, as directed by the Construction Manager.
- E. Where fill is to be placed against sewer lines, utility lines or other pipe that is coated or wrapped for protection against corrosion, the fill material up to an elevation 2 feet above the lines shall be free of any stones larger than one (1) inch in any dimension.

## 2.02 MATERIALS

- A. Fill Concrete: Structural fill concrete shall conform to the requirements specified in ACI 301. The minimum ultimate compressive strength shall be 2,000 psig at 28 days, unless otherwise specified. Fill concrete shall be placed as indicated on the Contract Drawings.
- B. Pea Gravel: Pea gravel shall be rounded particles, clean and free from objectionable material, graded from 1/8-inch to 3/4-inch in size in accordance with ASTM C 33. No more than three (3) percent of backfill material shall pass through #8 sieve.
- C. Crushed Stone: Crushed stone shall conform to the requirements of the NYCDOT.
- D. Plastic Marking Tape: Plastic marking tape shall be acid and alkali-resistant polyethylene film, six (6) inches wide with minimum thickness of 0.004 inch. Tape shall have a minimum strength of 1,750 psi lengthwise and 1,500 psi crosswise with an elongation factor of 350 percent. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to three (3) feet deep. The tape shall be of a type specifically manufactured for marking and locating underground utilities. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. Tape color shall be as specified herein and shall bear continuous printed inscription describing the specific utility.

**2.03 FROZEN EARTH**

No fillings and/or backfilling procedures will be allowed if:

1. The ambient air temperature is below freezing;
2. The fill material is frozen; or
3. The soil below the fill and/or backfill material is frozen.

**PART 3 - EXECUTION**

**3.01 BACKFILLING**

- A. No backfill shall be placed in any excavation until the subgrade has been inspected and approved by the Construction Manager.
- B. Backfilling for Tanks: Backfilling by the Contractor shall be performed in accordance with the manufacturer's instructions.
- C. Fill and backfill material shall be placed in layers not exceeding six (6) inches loose thickness for compaction by hand operated machine compactors, and eight (8) inches loose thickness for other than hand operated machines, unless otherwise specified. Pea gravel shall be placed in 12-inch lifts.
- D. Trench Backfill:
  1. Trenches shall be backfilled to the grade shown on Contract Drawings. The trench shall be backfilled to two (2) feet above the top of pipe prior to performing the required pressure tests. The joints and couplings shall be left uncovered during the pressure test.
  2. Bedding and Initial Backfill: Bedding shall consist of material and thickness shown on the Contract Drawings. Initial backfill material shall be placed and compacted with approved tampers to a height of at least one (1) foot above the utility pipe or conduit. The backfill shall be brought up evenly on both sides of the pipe for the full length of the pipe. Care shall be taken to ensure thorough compaction of the fill under the haunches of the pipe.
- E. Sidewalks and Miscellaneous Areas: Backfill shall be deposited in layers with a maximum of 12-inch loose thickness.
- F. Backfill for appurtenances: After the manhole, catch basin, inlet, or similar structure has been constructed and the concrete has been allowed to cure for at least three (3) days, backfill shall be placed in such a manner that the structure will not be damaged. The backfill material shall be deposited and compacted as specified for final backfill, and shall be brought up evenly on all sides of the structure to prevent eccentric loading and excessive stress.

### 3.02 COMPACTION METHODS

The Contractor shall place backfill and fill materials in layers not more than 8 inches thick in loose depth unless otherwise specified. Before compaction, moisten or aerate each layer as necessary to facilitate compaction to the required density.

For all fills, the Contractor is to ensure that the material is suitably compacted to at least the density state specified below. Any method of compaction which leads to the satisfactory state of compaction as specified below, and at the same time does not deleteriously influence other aspects of the Project can be used. The specific method of compaction proposed by the Contractor must be approved prior to use by the Engineer. The specific method of compaction can be achieved by vibratory rolling equipment, rubber tired roller equipment, light vibratory tampers, hand held tampers, or hand tamping, with the following exceptions:

1. When close to any retaining structure, either rigid or flexible, no heavy compacting equipment can come closer to the structure wall than 2/3 the unbalanced soil height at the time of compaction.
2. In and around any buried pipes or conduits, the soil must be compacted by either hand tamping or light vibratory tampers so as to provide complete and proper support all around the pipes or conduits. The hand procedures must be continued until at least one foot of cover above the pipes or conduits is achieved. The specific thicknesses of cover above the pipes or conduits required before heavy compaction equipment is again allowed to be determined so that the compacting equipment will not damage the pipes or conduits.
3. The use of any compacting equipment, either heavy or light, vibratory or static, must not cause damage to any other part of the project, or to any adjacent facilities and/or structures.
4. When compacting the placed fill before placement of the top slab over the tanks, light vibratory tampers or hand held tampers shall only be used so as to not damage the tanks and piping below.
5. Pea Gravel: Compacting of pea gravel shall be performed by light weight equipment such as walk-behind rollers or hand-held compactors. The Contractor shall compact the pea gravel until the elastic deformation between passes is less than one (1) inch with a minimum of four (4) complete passes with the compactor.

### 3.03 COMPACTION REQUIREMENTS

Except for "Crushed Stone" fills or backfill, all fills or backfills are to be placed in uniform lifts no greater than 8 inches loose thickness in its uncompacted state. Each lift must be uniformly compacted to the density as specified below before the next lift is placed. If any soft spots are found to exist in the lift, they must be recompacted to achieve the required density state before the next lift is introduced onto the fill or backfill. Each lift must be compacted to the following dry densities:

1. For those fills or backfills which will provide direct support under any load bearing element of a structure, the minimum acceptable dry density is 95% of the maximum dry density as determined by ASTM D 1557 (Modified Proctor Method).
2. For those fills or backfills which will provide direct support to floating slabs, placed around the pipes or conduits, or in utility trenches, the minimum acceptable dry density is 90% of the maximum dry density as determined by ASTM D-1557 (Modified Proctor Method).
3. For all other controlled fills or backfills to be placed in lifts, the minimum acceptable dry density is 90% of the maximum dry density as determined by ASTM D-1557 (Modified Proctor Method).

#### 3.04 CONTROL TESTING

- A. Three types of tests shall be performed to ensure the adequacy of the compaction of the fill; namely, field density tests using the sand cone method as described in ASTM D1556, laboratory compaction test series as described in ASTM D1557, and gradation testing as described in ASTM D422.
- B. The minimum number of field density tests that must be performed is specified in the following. These density tests are to be randomly located in any lift.
  1. At least one test must be performed on every lift.
  2. At least one test must be performed on every full shift of compaction operations.
  3. At least one test must be performed for every 200 cubic yards of material placed around a structure.
  4. At least one test must be performed for every 100 cubic yards of materials placed in trenches.
  5. At least one test must be performed for every 500 cubic yards of materials placed in large fills or embankment areas.
  6. Additional test must be performed whenever the Construction Manager suspects a change in either the quality of compaction or gradation of the backfill.
- C. The minimum number of Proctor Compaction Test Series required to support the compaction program is as follows:
  1. At least one compaction test series is required on each acceptable soil type that is used on the project. A soil will be considered a separate soil for these purposes whenever the percent retained on any sieve varies by more than 5% from the data initially provided by the Contractor.

2. Additional compaction tests series may be required by the Construction Manager for every 30 field density tests performed, if the Construction Manager suspects a variability of materials of the fill.
- D. At least four laboratory gradation curves must be provided for each soil type proposed for use by the Contractor on the project. These curves must be obtained from four separate samples of the fill, each sample, obtained from a 40 pound bag sample of the borrow material taken from different areas of the borrow area. Additional gradation curves must be provided by the Contractor when tests indicate a variability of materials of the fill or backfill, and submitted to the Engineer for approval.

### 3.05 ACCEPTABILITY OF COMPACTED FILL OR BACKFILL

The fill shall be considered suitably compacted whenever the following criteria are satisfied.

1. Two thirds of the field density tests shall indicate a variability of the in-place dry density of  $\pm 3\%$  of the mean measured in-place dry density, with no measured dry density varying by more than 7% from the mean value.
2. Ninety percent (90%) of all measured field density values must exceed the required dry density state as specified by the percent compaction listed above.
3. The density tests conducted on those lifts which are recompacted for any reason are not to be included in the computation of the required values specified in A and B above.

### 3.06 SUBSURFACE STRUCTURES

Subsurface structures shall be so supported that any settlements developed after compaction will not cause that structure to rest on any timber, rock, or other material that might cause damage to the structure. When dumping material for any purpose around subsurface structures, such structures shall be adequately protected with a timber shield to prevent possible damage.

### 3.07 REMOVAL OF SHEETING AND BRACING

If soldier beams and timber laggings are used for the excavation for the tanks, it shall be left in place and cut-off soldier beams at 18 inches below the finished grade after filling the excavation.

### 3.08 SPECIAL REQUIREMENTS

- A. Water Lines: Trenches shall be of a depth to provide a minimum cover of 48 inches from the existing ground surface, or from the indicated finished grade, whichever is lower, to the top of the pipe. For fire protection yard mains or piping, an additional six (6) inches of cover is required.
- B. Electrical Distribution System: Direct burial cable and conduit or duct line shall have a minimum cover of six (6) inches from the finished grade, unless otherwise indicated.

- C. Plastic Marking Tape: Warning tapes shall be installed directly above the pipe, at a depth of six (6) inches below finished grade, unless otherwise shown. Tape color shall be as specified in Table 1 and shall bear a continuous printed inscription describing the specific utility.

TABLE 1 - TAPE COLOR

Red:	Electric
Yellow:	Gasoline, Diesel, and Fuel Oil
Orange:	Telephone, Telegraph, Television, Police, and Fire Communications
Blue:	Water Systems
Green:	Sewer Systems

- D. Where fill is to be placed against sewer lines, utility lines or other pipe that is coated or wrapped for protection against corrosion, the fill material up to an elevation two (2) feet above the lines, shall be free of any stones larger than one (1) inch in any dimension.

END OF SECTION



SECTION 312319

DEWATERING SYSTEM

PART 1 - GENERAL

1.01 SCOPE OF WORK

The Contractor shall furnish all labor, materials, tools and equipment, for the purpose of designing, supplying, monitoring, maintaining, and operating necessary dewatering systems required for implementation of the excavation required to construct the proposed diesel fuel tank system.

1.02 SITE INFORMATION

Geotechnical information related to the site is included under separate cover within these Contract Documents. The Contractor shall become familiar with this information. It is noted that this is provided for informational purposes only. The Contractor is responsible for verifying all subsurface conditions as they relate to the design of the dewatering system.

1.03 DEWATERING SYSTEM PERFORMANCE REQUIREMENTS

- A. This is a performance-based specification. The design of the dewatering system shall be the responsibility of the Contractor, and shall be configured, constructed and maintained to meet the following minimal requirements:
1. The Contractor's dewatering system shall maintain the excavation in a dry condition during all construction operations and up to the time that the excavation has been completely backfilled.
  2. The Contractor's dewatering system shall work in conjunction with its excavation support system. Drawdown of the groundwater table shall be so as to maintain stability of the excavation support system and preclude instability, degradation, or heave of the excavation base.
  3. Operation of the dewatering system shall prevent subsidence or other damage to adjacent property, sewers, pavement, utility installations, and other work.
  4. There are no public sewers in the vicinity of the site that may be used to discharged groundwater collected by the dewatering system. Furthermore, the groundwater at the site is potentially petroleum-impacted. The dewatering system shall include features to containerize all extracted groundwater for eventual offsite disposal, or shall treat groundwater in such a manner as to allow discharge of waters to the Flushing Creek.
  5. The Contractor shall dispose of water so as not to cause injury to public or private property or to cause a nuisance or menace to the public and in accordance with the requirements or regulatory agencies. Petroleum contaminated water encountered in dewatering shall be analyzed/tested and disposed of in accordance with environmental regulatory requirements and as required by the Contractor-obtained permit(s).
  6. Where the Contractor's design requires drawdown or maintenance of the water table at a certain elevation or range of elevations, the dewatering plan shall include monitoring of groundwater levels to verify the requirements of the design. Groundwater monitoring shall occur at least on a daily basis and Contractor shall report all results to the Commissioner.
  7. If well points or wells are used, they shall be adequately spaced to provide the necessary dewatering and shall be sand packed and/or utilize other means to prevent pumping of

find sands or silts from the subsurface. A continual check by the Contractor shall be maintained to ensure that subsurface soil is not being removed by the dewatering operations.

8. No permanent piping systems or other features shall be incorporated in the dewatering system. Contractor shall completely remove from the site all components of the dewatering system once the excavation has been backfilled.
9. The responsibility for conducting the dewatering operation in a manner which will protect adjacent structures and facilities, rests solely with the Contractor. The cost of repairing any damage to adjacent structures and restoration of facilities shall be the responsibility of the Contractor. The Contractor shall develop a monitoring plan to observe existing structures or other site features for subsidence or lateral movement.

- B. Working Drawings: The Contractor shall create Working Drawings showing in detail the arrangement, location and depths of the proposed system, as required herein. The drawings and specifications shall be accompanied by supporting calculations and assumptions on which the design has been based.
- C. The Engineer shall review and approve the Contractor's dewatering system design. Engineer's approval shall not relieve the Contractor of meeting the performance requirements for dewatering. After the design is approved by the Engineer, it shall be submitted to other agencies having jurisdiction in the areas involved.

#### **1.04 SUBMITTALS**

- A. The Contractor shall submit for approval, a proposed method of dewatering for the project. The proposed method shall include but not be limited to complete Working Drawings, related data and calculations for construction of dewatering system.
- B. Working Drawings shall show, but not be limited to the proposed dewatering system, including general arrangement procedures to be used, method of installation of piping, locations and depths for any well or piping systems, materials, equipment, water service, procedures for testing the system, procedures for deactivating and removing the system, standby equipment, standby power supply, means and methods to containerize and/or treat collected water, procedures for final removal of collected waters, and necessary permits to be applied for. The submittal shall also include detailed calculations supporting the design of the dewatering system, and specific technical data for all equipment and materials to be utilized in the system. The working drawings shall also show the proposed location of any monitoring points to be set on adjacent structures to be used to ensure that the Contractor's dewatering system is not adversely affecting them.
- C. All working drawings, calculations, and data shall be signed by a Professional Engineer licensed by the State of New York.
- D. The Contractor shall prepare and submit for approval, contingency procedures for dewatering if settlement of adjacent structures is observed. The Contractor shall submit all monitoring data related to existing structures that is collected within 24 hours of when the data is collected.

**1.05 PERMITS**

- A. Prior to commencement of work under this contract, any permits or licenses required to perform the work shall be obtained by the Contractor at the Contractor's own expense. Determining license and permit requirements shall be the responsibility of the Contractor.
- B. Contractor shall submit copies of all permits obtained to the Commissioner, prior to commencing work.

**1.06 QUALITY CONTROL**

- A. The Contractor shall employ an independent, qualified Professional Engineer with experience in similar dewatering operations to review and approve the Contractor's proposed method of dewatering. The Professional Engineer shall inspect the Contractor's operations on a weekly basis and provide a report to the Construction Manager.

**PART 2 - PRODUCTS**

**2.01 EQUIPMENT AND MATERIALS**

- A. All equipment and materials utilized in the dewatering system shall be in accordance with the Contractor's approved design. Before operations begin, the Contractor shall have available on the site of work, sufficient pumping equipment and/or machinery to assure that the dewatering operation can be maintained.

**PART 3 - EXECUTION**

**3.01 METHODS**

- A. Dewatering shall be performed according to the Contractor's approved design and Working Drawings.
- B. In addition to the dewatering system, the Contractor shall prevent surface water from flowing into excavation and trenches. Accumulated water shall be pumped out immediately.
- C. Where critical structures or facilities exist immediately adjacent to areas of proposed dewatering, reference points shall be established and observed at frequent intervals to detect any settlement which may develop. Should significant settlement be observed, the Contractor shall immediately stop dewatering operations and implement contingency procedures.

**3.02 QUALITY CONTROL**

- A. All dewatering operations shall be adequate to assure the integrity of the finished project and shall be the responsibility of the Contractor.

- B. It shall be the sole responsibility of the Contractor to control the rate and effect of the dewatering as to avoid objectionable settlement and subsidence and to meet all permit requirements.
- C. Upon completing the installation of the dewatering system and prior to starting full operation, the system shall be verified and tested for adequate operation. Testing shall be performed per the Contractor's approved design, and in the presence of the Commissioner.

**END OF SECTION**

SECTION 315000

EXCAVATION

PART 1 - GENERAL

1.01 SCOPE OF WORK

The Contractor shall furnish all labor, equipment and materials required for excavation and disposal of materials. The Contractor shall perform all excavation operations as indicated on the Contract Drawings, or as directed by the Construction Manager. All soil excavated shall be considered to be contaminated with petroleum hydrocarbons.

1.02 RELATED WORK

SECTION: FILLING, BACKFILLING AND COMPACTING FOR STRUCTURES

1.03 APPLICABLE REFERENCES

The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation and shall be latest published version. When there is more than one regulation governing this Section, the more stringent regulatory requirement shall apply.

A. American Society for Testing and Materials (ASTM):

ASTM A 328	Standard Specification for Steel Sheet Piling
ASTM C 33	Specification for Concrete Aggregates
ASTM D 422	Particle-Size Analysis of Soils
ASTM 698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D 1241	Standard Specification for Materials for soil Aggregate Subbase, Base, and Surface Courses
ASTM D 1556	Density of Soil In Place by the Sand-Cone Method
ASTM D 1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
ASTM D 2167	Test Method for Density and Unit Weight of Soil In Place by the Rubber Balloon Method
ASTM D 2216	Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D 2487	Classification of Soils for Engineering Purposes
ASTM D 2937	Density of Soil In Place by the Drive-Cylinder Method
ASTM D 4318	Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D 4914	Standard Test Methods for Density of Soil and Rock In Place by the Sand Replacement Method in a Test Pit
ASTM E 548	Generic Criteria for Use in the Evaluation of Testing and Inspection Agencies
ASTM D 6938	Moisture Content of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)

B. Building Code of the City of New York.

C. American Welding Society (AWS)

Code for Welding in Building Construction

D. All applicable rules and regulations for Occupational Safety and Health Administration (OSHA), United States Environmental Protection Agency (USEPA), NYCDEP, and NYCDOT.

E. New York State Department of Environmental Conservation

6NYCRR Part 360-1.15 Beneficial Use

6NYCRR Part 360-7.4 C&D Debris Landfills Greater than Three Acres

STARS Memo #1 Petroleum Contaminated Soil Guidance Policy

TAGM SW-89-2002 Construction and Demolition Debris

TAGM HWR-94-4046 Determination of Soil Cleanup Objectives and Cleanup Levels

#### 1.04 DEFINITIONS

A. Earth Excavation

Earth shall mean all materials of whatever nature encountered, except rock as defined in Paragraph 1.04.B below, and the removal of masonry as defined in Paragraph 3.13. Removal of the following shall, among other things, be classified as earth excavation: filled ground (including rock fill), foundations and vaults of buildings, concrete or steel piles, pavements, abandoned street surface railroads (including foundations), abandoned elevated railroad column piers and footings curbs and sidewalks with their foundations, valve chambers, pipe galleries, manholes, basins, sewers, ducts and conduits, pipes, tubes and drains. Removal of soft, decomposed or disintegrated rock, which in the opinion of the Construction Manager, can be removed by means other than blasting, channeling, wedging, barring or other method ordinarily used to remove hard ledge rock, will also be classified as earth excavation.

B. Rock Excavation

Rock shall mean the hard ledge rock in its natural bed, which is removed by channeling, wedging or barring. Such methods of rock excavation shall be submitted for approval. Excavation of the material claimed as rock shall not be performed until the area has been surveyed by the Contractor and approved by the Construction Manager.

C. Unstable Material

Unstable material shall consist of materials too wet or too soft to properly support a structure, as determined by the Construction Manager.

**D. Unsatisfactory Materials**

Unsatisfactory materials include, but are not limited to, those materials containing roots and other organic matter, trash, debris, frozen materials, and stones larger than four (4) inches, and materials classified in ASTM D 2487 as PT, OH and OL.

**1.05 SUBMITTALS**

- A. The Contractor shall furnish the proposed methods of excavation and a description of all earth moving and excavation equipment to be used in performing the work.
- B. The Contractor shall submit Excavation Design Drawings for the approval of the Engineer.
- C. Braced Excavation: If due to space restriction the Contractor must adopt braced excavation instead of open cut excavation, then the Contractor shall submit the proposed method of supporting the excavation. The drawings shall indicate all dimensions of waling and bracing and tiebacks or anchors necessary to support the excavation. The Contractor shall submit calculations of lateral earth pressure, design of sheeting, and bracing, tiebacks or anchors, and settlement calculations behind the sheeting due to dewatering, and all permits required in conjunction with the excavation operation. These calculations shall be signed by an appropriately experienced New York State P.E.
- D. A drawing showing all utility locations.
- E. Quality Control Submittals
  - 1. Design Data shall be submitted by the Contractor including, but not limited to, gradation analysis for fill materials, gradation analysis for aggregate bases, gradation analysis for broken stone ballast, and material composition analysis of recycled concrete material.
  - 2. Condition Survey Submittals shall be provided by the Contractor including, but not be limited to, copies of all photographs and survey logs and benchmarks required by the Construction Manager and the Contract Documents.
  - 3. Certificates shall be provided by the Contractor including, but not limited to, certificate guaranteeing fill and backfill materials used for construction complies with the regulator and Contract Document requirements, and certificate guaranteeing aggregate materials used for construction conforms to the gradation supplied. The Contractor shall also provide facility permits, disposal requirements, and waste analytical requirements for each proposed off-site disposal facility and a letter from the borrow area(s) stating the at the imported fill is environmentally clean.
- F. The Contractor shall explore the adjacent building or structure foundations to the excavated area as required. This exploration for the building or structure base elevations, and dimensions shall be by bar probing in a protected test pit(s) as approved by the Construction Manager. The Contractor shall provide underpinning of adjacent buildings and structures as required by the Contract Documents or regulatory requirements. The

Contractor shall submit the design details, calculations, and drawings for the underpinning signed by a professional engineer licensed in the State of New York.

- G. Dewatering design, procedures, and equipment.
- H. ASTM Testing results for backfill material prior to and after placement to verify compliance with compaction requirements.

**1.06 PERMITS**

- A. Prior to Commencement of work under this Contract, all permits and licenses required to perform the work shall be obtained by the Contractor. Determining permit and license requirements shall be the sole responsibility of the Contractor.
- B. The Contractor shall obtain all necessary excavation (digging) and road/parking lots permits from the New York City Department of Buildings, New York City Fire Department, NYSDOT and NYCDOT. The Contractor shall allow 14 calendar days from the date of written permit application to receive permission to dig or to partially close roads/parking lots.

**PART 2 - MATERIALS**

**2.01 STEEL SHEET PILING**

All steel sheet piling shall conform to ASTM A328 and ASTM A6/A6M.

**2.02 TIMBER FOR SHEETING AND BRACING**

All timber used for sheeting, shoring, bracing, or other temporary purposes, shall be sound and free from any defects that may impair its strength. Timber shall be spruce, douglas fir, white or yellow Lodgepole or Ponderosa pine, or western hemlock plank, planed on one side and either tongued and grooved or splined. Species, grades of timber and allowable stress shall be indicated on Contract Drawings or within Contract Specifications. Timber shall not be less than nominal 4 inches thick and wooden sheeting shall not be less than nominal two inches thick. All sheeting and timber used temporarily shall be put in place by competent workers, shall be keyed tight by wedges where necessary and so arranged as to be withdrawn readily without endangering the adjoining soil.

**2.03 STRUCTURAL STEEL**

Structural steel shall conform to ASTM A36.

**PART 3 - EXECUTION**

**3.01 EXCAVATION**

- A. Special care shall be taken to avoid damage wherever excavation is being performed. Excavation regardless of the material encountered shall be performed to the lines and grades indicated on the Contract Drawings. Excavations carried below the depths



indicated, without specific directions or approval, shall be backfilled to the required grade with approved material as directed by the Construction Manager at the Contractor's expense. Whenever any subsurface structure is encountered or suspected of being within the area of excavation, the Construction Manager may direct that the excavation proceeds using hand tools.

- B. Excavated materials shall be removed expeditiously. Disposal shall be subject to the ordinances and regulations of the New York City Authorities and other laws governing the disposal of such materials and the regulations of the United States Government as to the disposal or dumping of material in and about or near the Harbor of New York. The Contractor shall inform the Construction Manager of the site for dumping the excavated material and shall furnish the Construction Manager with copies of all permits in conjunction with this operation. Waste manifests shall also be provided to the Construction Manager.
- C. The Contractor shall not exceed the limits of excavation as shown on the Contract Drawings without permission from the Construction Manager. Excavations which expose building foundations, or other structures to remain in place can only be authorized by the Construction Manager.
- D. The Contractor shall barricade open excavations and post with warning lights. The Contractor shall operate warning lights during hours from dusk to dawn each day as required.
- E. The Contractor shall protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by excavation operations.
- F. Existing utilities and existing structures (including underground structures) shown on the Contract Drawings represent all conditions known to the Construction Manager. Other construction, of which no records are available, may be encountered. The Contractor shall obtain all existing information of underground utilities from the City and utility companies. The Contractor shall obtain approval from the Construction Manager and the Engineer before proceeding with excavation operations.

### 3.02 EXCAVATION OF CONTAMINATED SOIL

- A. Excavation of contaminated soil shall be to the lines and grades shown on the Contract Drawings. Excavations shall comply with New York City and OSHA regulations, whichever is stricter. If unstable earth is encountered in the excavation, the Contractor shall remove all unsuitable material and replace it to the satisfaction of the Construction Manager. The limits of the excavation shall be determined by laboratory analysis of soil samples collected within the excavation as described in the Contract Drawings. Soil samples shall be submitted to an approved laboratory for analysis as indicated on the Contract Drawings. Petroleum contaminated soil shall be stockpiled in accordance with Paragraph 3.03. Petroleum contaminated soil shall be disposed of in accordance with paragraph 3.04.

- B. Samples for analytical analysis shall have a 48-hour turn around time. All samples are to be shipped on the day of collection for overnight delivery to the laboratory. Turn around time is defined as the number of hours for the Contractor to provide preliminary analytical results after sample receipt by the laboratory. The Contractor shall be responsible for supplying bottles, sampling, packaging, handling, and shipping of samples.

**3.03 STOCKPILING OF EXCAVATED SOIL**

Petroleum contaminated soil shall be stockpiled on and covered by 10 mil polyethylene sheets. The polyethylene cover shall provide a protective barrier against rainwater and wind. The cover shall be securely anchored to the satisfaction of the Construction Manager. The Contractor shall provide a dike around the stockpile to prevent petroleum contaminated materials and liquid from migrating off the polyethylene sheets. Stockpiling shall be done to the satisfaction of the Construction Manager. Petroleum contaminated soils shall be disposed of in accordance with Paragraph 3.04.

**3.04 DISPOSAL OF EXCAVATED SOIL**

- A. All excavated soil shall be tested for contamination. If found contaminated, the soil must be disposed of in accordance with applicable New York City, State and Federal regulations. The Contractor shall dispose of all petroleum contaminated soil at a facility, which is permitted by the New York State Department of Environmental Conservation to accept such materials. The Contractor shall secure all permits required in connection thereof and provide the Construction Manager with all documentation regarding the disposal of such soil. New York State guidance document stipulates that diesel, lubricating and heating oil contaminated soils is non-hazardous industrial waste.
- B. If at anytime during the course of construction the Contractor deems any soil to be contaminated other than that which has been previously identified, the Contractor shall immediately notify the Construction Manager. The Construction Manager will take the appropriate action to identify the soil as contaminated by field examination for possible petroleum contamination (i.e., soil discoloration and petroleum odors). Upon determination by the Construction Manager that the suspect soil is contaminated, the Contractor shall be authorized by the Construction Manager to dispose of the soil as per Paragraph 3.04(A).

**3.05 PROTECTION AGAINST DUST HAZARD**

Equipment for the elimination of dust produced by excavation, rock or masonry drilling, or other operations, shall be installed, maintained and effectively operated by the Contractor to protect property against dust and workmen against the inhalation of harmful dust. All such equipment must be approved by the Construction Manager and the New York State Department of Labor. In the event that conditions are encountered in any area which, in the determination of the Construction Manager, render the use of such equipment ineffective or impracticable, operations in such area shall be performed by alternative methods approved by the Construction Manager which minimizes the generation of dust, if approved by the said Department of Labor.

**3.06 SHEETING AND BRACING**

- A. The Contractor shall place all sheeting, bracing and other temporary protective work which may be needed to properly and adequately support the sides of all excavation in a safe and workman-like manner and to protect adjacent work and structures. The sides of the excavations shall be maintained and secured by suitable sheet piling or sheeting or as otherwise indicated on the Contract Drawings. The sheet piling or sheeting shall be held in place by soldier beams, braces, tiebacks, shores, or wales or alternative methods as specified on the Contract Drawings. Special precautions shall be taken where there is additional pressure due to the presence of buildings or other structures. The sustaining members in the bracing system shall be designed to furnish sufficient reaction against the side banks to maintain stability as well as to prevent loss of ground adjacent to the excavation. Such reaction in the members shall be obtained by preloading or, by the use of suitable wedges properly driven into the joints between such members until the necessary reaction is produced against the banks or by such other methods as may be approved by the Engineer. Wherever necessary, steel plates and wedges shall be used in driving up the members to produce such reaction. End bands of bulkheads shall be sheeted and braced in such manner that the compression stresses from such banks are transmitted through diagonal braces into sidewalls or the subgrade, or both, as necessary. Special care shall be taken to assure the stability of the foundations of the vertical supporting posts.
- B. Wherever, in connection with the construction of the Project, it is advisable in the opinion of the Construction Manager to use steel sheet piling, steel sheeting, steel bracing, and/or excavation protection system in lieu of wood or timber to support the excavation or for any other purpose, upon the written order of the Construction Manager, the Contractor shall furnish and install such steel sheet piling, steel sheeting, steel bracing, and/or excavation protection system.
- C. The sheeting shall be so designed and placed as to prevent as far as possible the natural ground behind the sheeting from moving and shall furnish a full bearing against the banks, voids behind the sheeting being filled when necessary to obtain such bearing. Sheeting shall be driven or placed as best suited to the local conditions. The excavations shall not be made in advance of or below the bottom of the sheeting. Sheeting shall be started at the surface or, according to the local conditions, at such depths below the surface as may be necessary.
- D. Where excavation is near or adjacent to a building and/or bridge column or pier, the sheeting shall be started at such depth in relation to the foundation of each such building and/or bridge column or pier as may be necessary to prevent displacement of the soil which supports the building.

**3.07 WELDING TEMPORARY STEEL**

Whenever field welding of temporary steel members is required in connection with the bracing and decking systems, such welding shall conform to the requirements specified in AWS "Code for Welding in Building Construction".

**3.08 ROCK TO BE STRIPPED**

Whenever rock is encountered in the excavation before reaching the final elevation, the Contractor shall remove common material as required and the Construction Manager shall be duly notified in order that he may measure the cross-section of the rock area prior to excavation of exposed rock.

**3.09 SAFEGUARDING EXISTING SEWERS**

The Contractor shall take all precautions necessary to safely maintain the integrity of existing sewers. In case any existing sewers so maintained are intermittently subjected to flow under pressure, the Contractor shall, unless otherwise permitted by the Construction Manager, construct the new sewers or siphons, as the case may be, and divert the flow into them before the contiguous excavation for the Project is removed to a depth where the breaking of an existing sewer might endanger the Project or the temporary street supporting and shoring systems.

**3.10 SURFACE DRAINAGE**

At all times gutters shall be kept open for surface drainage and the street, and sidewalks shall be kept clear and free for the passage of vehicles or pedestrians, and as otherwise provided in these Specifications.

**3.11 STREETS TO BE FREE FROM OBSTRUCTIONS**

All curb, gutter, flagging, paving and macadam stones, necessary to be removed which, in the judgement of the Construction Manager are suitable to be used again, shall be stored in such places as the Construction Manager shall direct, or if unsuitable shall be removed and disposed of. In all cases a passageway of approved width on the sidewalks and in the roadway shall be preserved free from obstructions in accordance with Work Permit from Department of Transportation.

**3.12 DEWATERING**

The Contractor shall take precautions to prevent water from entering the excavation. The Contractor shall remove water and/or groundwater from the excavation and treat water and/or groundwater to specified concentrations by the local, state, or federal regulations.

**3.13 REMOVAL OF MASONRY**

The Contractor shall cut out, remove and dispose of the concrete or other masonry (including waterproofing, ducts, steel rods, bars, beams, columns or other steel imbedded in such masonry) as indicated on the Contract Drawings or as directed by the Construction Manager. The masonry shall be cut to exact lines. Any excess removal of material outside the net lines shall be replaced by new material provided and placed at the Contractor's own expense.

**3.14 REMOVAL OF VAULTS**

The removal, where necessary, of all walls and other parts of vaults, adjacent to areas of abutting property along the lines of the Project that are within the ordered net lines of excavation shall be considered as earth excavation. Vaults will not be restored under this Contract.

**3.15 REMOVAL OF FOOTING OF ABUTTING BUILDINGS**

Where the Project passes close to the building line along any street, the portion of footings of abutting buildings that project within the neat line of excavation for the Project shall be removed where directed by the Construction Manager. Such projecting footings may not be shown on the Contract Drawings exhibited with this Contract or they may not be otherwise specifically indicated by this Contract.

**3.16 CONCRETE MASONRY UNITS IN BUILDING VAULTS**

Wherever vaults of abutting property are broken through or otherwise disturbed, the Contractor shall provide all materials for and erect a concrete masonry units wall laid in Portland cement mortar, as a temporary partition, on or about the building line, or as directed by the Construction Manager that will provide proper protection to the owner or occupant of the adjoining premises. Upon the completion of the work adjacent to the vault such wall shall, unless otherwise directed, be immediately removed and disposed of by the Contractor.

**3.17 DRILLING HOLES IN MASONRY**

The Contractor shall, where indicated on the Contract Drawings or as directed by the Construction Manager, drill holes for dowels in the masonry of the existing structure for securing the new construction thereto.

**3.18 STEEL PLATES**

Steel plates shall be used as decking over all trench/excavations. Steel plates shall be of sufficient strength. Steel plates shall be made skid-resistant in an approved manner and adequately secured from movement. Overlapping of steel plates will not be permitted. Signs shall be erected at all exterior steel plate locations indicating that "Snowplows shall raise blades".

**3.19 DELIVERY, STORAGE, AND HANDLING**

Imported fill and aggregate materials shall be stockpiled separately at the producer's facility and shall be accessible to inspection and quality control (QC) testing by the Construction Manager. Stockpile material in such a manner to prevent erosion and dust providing silt curbs if necessary. Testing and certification of all imported environmental clean fill shall be the responsibility of the Contractor.

**3.20 IMPORTED FILL AND BACKFILL**

Only environmentally clean material (e.g., material that has been tested and found not to contain levels of organic compounds or inorganic analytes above NYSDEC TAGM HWR-94-4046 recommended soil cleanup criteria) shall be used as imported fill and backfill. All imported fill and backfill shall be material classified as controlled fill by the New York City Building Code. Composition shall consist of sand, gravel, crushed stone, crushed gravel, or a mixture of these backfill materials. These fill materials shall contain no particles exceeding 4-inches in the largest dimension. No more than 30% of the material shall be retained on a ¾-inch sieve. The material passing the ¾-inch sieve shall contain, by weight, no more than 40% passing the No. 100 sieve, nor 12% passing the No. 200 sieve. Backfill material shall be free from discarded construction

material and debris. The Contractor has the option of either providing the Construction Manager with a letter from the borrow area(s) stating that the material proposed for use as fill/backfill is environmentally clean or providing the Construction Manager with laboratory data on material proposed for use as imported fill/backfill. The Contractor shall collect and analyze one representative sample of the material for each 1,000 cubic yards of imported fill/backfill brought to the site for TAGM HWR-94-4046 parameters.

**3.21 SHORING AND UNDERPINNING**

- A. The Contractor shall inspect site, examine existing conditions, and make all necessary preparations for the safe and proper sequence of work. The Contractor shall properly guard and protect excavations so as to prevent them from becoming dangerous to person or property.
- B. The Contractor shall properly slope side of excavation or provide shoring, sheeting, and bracing to prevent caving, erosion or gulying of excavation sides.
- C. The Contractor shall brace, shore, and protect existing structures and buildings when excavations are made adjacent to the existing structures and buildings within a distance that the excavation will affect them. Underpin adjacent structures and buildings when excavations are carried to a depth that will require it by the NYC Building Code, when directed by the Construction Manager, or as indicated on the Contract Drawings.
- D. The Contractor shall maintain sides and slopes of excavation in safe conditions until backfilling or other work is complete and maintain shoring or bracing in place until completion of work.
- E. Sheet piling, shoring, and underpinning for protection of excavation and adjacent structures and buildings and the public shall be the responsibility of the Contractor and shall comply with all applicable requirements of the NYC Building Code. Excavations shall not remove lateral support from any footing or foundation without first underpinning or protecting the footing or foundation against settlement or lateral translation. The most stringent requirements of the NYC Building Code, Contract Drawings and Specifications, or any other authorities or regulatory requirements having jurisdiction shall govern this work.
- F. The Contractor shall engage a professional engineer licensed in the State of New York to prepare details and designs of underpinning, cofferdams, caissons, bracing, shoring and other construction required for the excavation protection system and support of adjacent properties, structures, and/or buildings. These drawings and designs shall bear the seal and signature of a professional engineer licensed in the State of New York complying with all regulatory requirements. These drawings and designs shall be submitted to the Construction Manager for general review, which does not relieve the Contractor's Engineer of responsibility for the adequacy of the design.
- G. The Contractor's Engineer shall file the required NYCDOB forms (PW-1 and TR-1) thereby becoming the Engineer of Record for the excavation protection system, underpinning design, and responsible for stability of all slopes and bracing and for

preparation of all design and shop drawings and their approval by the Building Department as well as the controlled inspection of all work.

**3.22 SUPPORT AND PROTECTION SERVICES**

**A. Permanent Sheeting:**

1. Under this work, the Contractor shall furnish and place permanent sheeting of the type, at the locations and to the elevation(s) shown on the plans. All the sheeting and supports shall be left in place as a finished structure unless removal of waling and bracing is called for on the plans.
2. Timber sheeting shall be new and unused and consist of any acceptable species which can be placed satisfactorily. The sheeting shall have a preservative treatment conforming to the American Wood-Preservers Association (AWPA) Standard C-2, Soil Contact. The timbers shall not be less in actual cross section or stress grade than that shown on the plans. Stress grading and acceptance shall be in accordance with the requirements and provisions of NYSDOT §712-14, Stress Graded Timber and Lumber. The timbers shall be sound and free from any defects which might impair its strength or tightness. The materials shall include all necessary waling and bracing required.
3. Steel sheeting shall be new and unused conforming to the requirements of ASTM A328M unless otherwise indicated on the plans. Waling and bracing shall be new and unused conforming to the requirements of ASTM A36M unless otherwise indicated on the plans. The sheeting shall not have a section modulus less than that shown on the plans. Stock steel may be used. The Contractor shall furnish to the Construction Manager, certified copies of physical and chemical test results which shall include a sworn statement by a qualified mill representative to the effect that the subject material conforms to the requirements of the steel specified.

**B. Temporary Sheeting:**

1. This work shall include the requirements specified in Permanent Sheeting with the following addition: The Contractor shall be required to maintain the sheeting while in place, and remove it from the job site after its function has been accomplished or when ordered by the Construction Manager. It may be left in place only with the written permission of the Construction Manager.
2. The provisions of NYSDOT §552-2.01A Permanent Timber Sheeting shall apply with the following modifications: The timber sheeting may consist of new or used, treated or untreated material but must be in satisfactory condition and suitable for the intended use. The Construction Manager may disapprove and reject used materials regarded to be unsatisfactory.
3. The steel sheeting, waling and bracing may consist of new or used material but must be in satisfactory condition and suitable for the intended use. The section modulus of the sheeting shall not be less than that shown on the plans. The materials shall include all necessary waling and bracing required. The

Construction Manager may, disapprove and reject used materials regarded to be unsatisfactory.

C. Interim Sheeting:

1. Under this work, the Contractor shall furnish and place sheeting of the type, at the locations and to the elevation(s) shown on the plans. The Contractor shall be required to maintain the sheeting while it is serving its function. The interim sheeting shall be cut off and removed only to the elevation shown on the plans. The remaining material shall be left in place.
2. The provisions of NYSDOT §552-2.02A Temporary Timber Sheeting shall apply.
3. The provisions of NYSDOT §552-2.02 B Temporary Steel Sheeting shall apply.

D. Excavation Protection System:

1. Under this work, the Contractor shall design, furnish, place maintain and remove an excavation protection system (EPS) at locations shown on the plans or as ordered by the Construction Manager. Details of the EPS must conform with the requirements of 29CFR1926 and installation shall be in accordance with the State and Federal Safety Codes. A sloping (layback) option will not be allowed.

Sheeting, shoring, a shield system, i.e. trench box or trench shield or other pre-engineered protective system may be used to prevent cave-ins. The requirements of any protective system shall be as contained in 29CFR1926. It may be left in place only with the written permission of the Construction Manager.

E. Construction Details:

1. Any material which stops the driving of sheeting within a depth of three meters from the ground surface at the time of driving, shall be removed by the Contractor. If very compact material or boulders prevent the progression of the sheeting to the design tip elevation at a greater depth, the Contractor shall notify the Construction Manager.

2. Temporary Sheeting: The requirements of NYSDOT §552-3.01 General shall apply with the following addition:

Upon completion of the structure, the Contractor will remove the sheeting placed under this work, or with written permission of the Construction Manager, leave it in place after cutting off the tops at an agreed elevation.

3. Interim Sheeting: The provisions of NYSDOT §552-3.01 General shall apply with the following modification:

The interim sheeting shall be cut off and removed only to the elevation shown on the plans. The remaining material shall be left in place.



4. Excavation Protection System: The EPS installed under this item shall be of sufficient size and strength to meet the requirements of Title 29, Code of Federal Regulations, Part 1926, Safety and Health Regulations for Construction (OSHA), and the Live Load requirement as contained in the Standard Specifications for Highway Bridges adopted by AASHTO. Prior to use, the Contractor shall supply the Construction Manager with documentation of compliance.

All damage to the adjacent pavement or ground caused by the use of the chosen EPS (e.g. Voids beneath the pavement or shoulder, pavement or shoulder cracking or subsidence, ground settlement) shall be repaired to the satisfaction of the Construction Manager at no additional cost to the City. Severe damage which directly affects the safety of the public shall be immediately repaired to the satisfaction of the Construction manager. The operation shall be halted until a satisfactory prevention method is instituted.

### 3.23 FILLING AND GRADING

#### A. General

1. Do not commence filling and backfilling operations until construction below finish grade has been approved, underground utilities and mechanical items inspected and tested, forms removed, waterproofing or dampproofing and other improvements installed, trash and debris removed, and temporary and permanent bracing installed.
2. Do not commence backfilling, filling and grading until existing subgrades have been compacted.
3. Backfilling of trenches is described under "Backfilling of Trenches", Section 3.24.
4. Fill all excavations, backfill against all walls, and do all filling and grading necessary to bring the surfaces to the level required.
5. Do not backfill against concrete elements until the concrete has obtained its specified compressive strength.
6. Perform backfilling around foundation walls when in the opinion of the Construction Manager the first floor (and/or second floor or basement depending on the building) tier of beams and/or concrete slabs form sufficient bracing to withstand the backfill pressure. All other fill, backfill, and rolling to approximately finished grades shall then be completed.
7. Take particular care when rolling over areas where trenches or other excavations have been made and backfilled.
8. Fill voids caused by the removal of below grade improvements.

9. Grade bottoms of pavements and area way bottoms toward sediment pits or catch basins to maintain uniform thickness of the slabs.
  10. A minimum of twelve inches of environmentally clean soil will be used on all exposed ground surfaces (including landscaped areas).
- B. Compaction of existing subgrade
1. Site preparation  

Existing subgrade shall be free from stumps, brushes, roots, sod, topsoil, rubbish, garbage, and any other material that may decay.
  2. Grading
    - a. Prior to placing fill or backfilling in any area, grading is to be performed as required to provide for drainage. Ditching or filling around the area will be performed to intercept or divert all surface water. Within the area the ground which fill is to be placed will be graded so as to provide for unobstructed drainage from every point to a sump or other disposal point.
    - b. On completion of grading as specified above, closely examine to determine whether excessive wetness, springs, or other seepage of water can be observed at any point. If such conditions exist, positive drainage in suitable form, such as french drains or tilling, must be provided before placement of fill is undertaken.
    - c. When the fill area has been prepared as specified above, compact the natural ground surface by methods indicated in 3 below.
  3. Method of Compaction
    - a. Natural undisturbed material shall be graded and compacted to attain a uniform surface. These areas shall be determined by the Construction Manager designated for Controlled Inspection.
    - b. Existing subgrade shall be proofrolled in the presence of the Construction Manager designated for Controlled Inspection for the following conditions:
      1. Subgrade consists of uncontrolled fills.
      2. Identification of shallow loose zones of material or identification of soft/spongy material at surface.
    - c. Proofrolling shall be accomplished with a minimum of four passes using a compactor of minimum static weight of 19,000 lbs, a minimum dynamic force of 40,000 lbs, and a total applied force of not less than

7,500 per foot of drum width. In areas inaccessible to the heavy equipment, provide a minimum of six passes with a vibratory plate or jumping compactor. Fill shall not be placed until the subgrade is approved by the Construction Manager designated for Controlled Inspection.

4. **Soft Areas During Compaction:** If any areas show pumping, noticeable weaving, or which are otherwise unsatisfactory, undercut material within the limits and extent ordered by the Construction Manager designated for Controlled Inspection. These areas shall be replaced with controlled fill, compacted to 92% (95% in vehicular areas) of maximum dry density by ASTM D1556 and D1557 at optimum moisture content, unless otherwise directed by the Construction Manager.

**C. Placement and Compaction of Fill and Backfill**

**1. Placement**

- a. **General:** Begin fill and backfilling in the lowest section of the area. Spread material evenly by mechanical equipment or by manual means above the approved compacted subgrade in lifts not exceeding 6" to 8" for material compacted by heavy machinery and 4" for material compacted by hand tamping unless directed otherwise by the Construction Manager. Build layers as horizontally as practical to prevent thickness of lift from exceeding that specified but provide with sufficient longitudinal and traverse slope to provide for runoff of surface water from every point.
- b. **Moisture Control:** The moisture-density curve for the fill use shall be supplied to the Contractor as a guide in controlling moisture to achieve the required degree of compaction. If, in the opinion of the Construction Manager, fill material becomes too wet for the required compaction, the fill shall be dried by a method approved by the Construction Manager prior to commencing or continuing compaction operations. Likewise, if, in the opinion of the Construction Manager, the fill material becomes too dry for the required compaction, the fill shall be moistened by a method approved by the Construction Manager prior to commencing or continuing compaction operations.

2. **Compaction:** Compact each lift to the degree of compaction indicated below. The degree of compaction shall be checked by the Construction Manager and each successive lift shall not be placed or compacted until the previous lift is inspected and approved by the Construction Manager. Compact the fill and backfill to elevations and limits shown on Drawings or grade subject to final inspection and approval by the Construction Manager. Extend the compacted fill beyond the berm lines on a slope downward at a maximum slope of two horizontal to one vertical to intersect the approved stripped subgrade. Maintain the fill slopes at all times.

- a. Areas to receive heavy vehicular traffic: 95% of the maximum dry laboratory density by D1557 at optimum moisture content.
  - b. All other areas: 92% of the maximum dry laboratory density by D1557.
3. Drainage During Fill Operation: At all times, maintain and operate proper and adequate surface and subsurface drainage to the satisfaction of the Construction Manager in order to keep the construction site dry and in such condition that placement and compaction of fill may proceed unhindered by saturation of the area. Submit method of dewatering to the Construction Manager for prior approval. Such approval shall not relieve the Contractor of his responsibility to maintain the site dry during the compaction operation.
  4. Frost: Do not place fill materials when either the fill materials or the previous lift (or subgrade) on which it is placed is frozen. In the event that any fill which has already been placed on the surface shall become frozen, it shall be scarified and recompact, or removed, to the approval of the Construction Manager before the next lift is placed. Remove or recompact any soft spots resulting from frost to the satisfaction of the Construction Manager before new fill is placed.
- D. Placement and Compaction of Aggregate Bases and Broken Stone Ballast
1. Provide aggregate base under all pavements, interior slabs on grade, and wherever else indicated on the Drawings or specified herein. Provide 6" minimum unless specified otherwise elsewhere.
  2. Verify finished subgrade is at proper level.
  3. Prior to placement of material, reroll subgrade with a two ton roller or hand tamper.
  4. Place aggregate base in layers of uniform thickness, but not exceeding 6". Compact material to either 80% of relative density or 92% (95% for heavy vehicular traffic areas) of maximum dry density at optimum moisture in accordance with ASTM D1557. Maintain optimum moisture content for compacting the material. Place material in single layer for aggregate courses six inches or less. Alternate blading and rolling to obtain a smooth, even, and uniformly compacted course.

### 3.24 BACKFILLING OF TRENCHES

#### A. General

1. Do not backfill trenches until tests and inspections have been made and the backfilling authorized by the Construction Manager. Use care to avoid damage or displacement of pipe or conduit.

2. Backfill with controlled fill and compact each layer to 92% (95% for vehicular areas) of its maximum density as per ASTM D1557 using a vibratory plates, jumping compactors, or other approved means.

**B. Piping**

1. Backfill piping immediately after piping lines are tested and inspected and approved by representatives of the NYC Department of Building, other regulatory agencies having jurisdiction, and the Construction Manager.
2. For piping and trench drains encased in concrete, backfill immediately after concrete has attained its required strength and after inspection and approval by the Construction Manager.
3. Backfill trenches by hand and place in uniform layers not exceeding 4" in depth up to a level of one foot over the crown of the pipe and/or presloped trench drain invert. Each layer shall be placed, then carefully and uniformly tamped, using a hand tamper in such a manner as to avoid injury and displacement of the pipe and/or presloped trench drain.
4. Backfill the remaining height of the trench as previously specified, except that the layers shall be uniformly compacted using a mechanical vibrator tamper. Limit the addition of water during backfilling to provide optimum moisture content for tamping procedures.

**C. Conduits**

1. Backfill trenches immediately after conduit pipes are laid therein, inspected, and approved by the Construction Manager.
2. Backfill trench by hand and place in uniform layers not exceeding 4" in depth to a level of one foot above the top of the conduits. Each layer shall be placed, then carefully and uniformly tamped, using a hand tamper in such manner to avoid injury and displacement of the conduits.
3. Backfill the remaining height of the trench as previously specified, except that the layers shall be uniformly compacted using a mechanical vibrator tamper. Limit the addition of water during backfilling to provide optimum moisture content for tamping procedures.

**3.25 FIELD QUALITY CONTROL**

**A. Tests**

1. Sieve Analysis: The Contractor's Laboratory will perform sieve analysis in accordance with ASTM D422 on fill and aggregate materials at the site prior to placement in order to verify conformance with the submitted samples.

2. Field density tests: The Contractor's Laboratory will perform in-place field density tests in accordance with either of the three following procedures; ASTM D1556, ASTM D2167, or ASTM D6938.

- a. Existing subgrade. One field density test for each 200 ft<sup>2</sup>, but in no case less than three tests.
- b. Fill areas – For each lift, one field density test for each 200 ft<sup>2</sup>, but in no case less than three tests.
- c. Backfill areas – For each area, two field density tests per lift at locations determined by Construction Manager for Controlled Inspection and one test per lift for every 50 linear feet of trench.

3. Load Bearing Tests

If required, the Contractor's testing laboratory will perform load bearing tests to determine the soil bearing capacity where suspect. Provide access to site and cooperate with the Authority's testing laboratory in completing the load bearing tests.

4. Environmentally Clean Fill/Backfill Tests

If required, the Contractor's testing laboratory, as a quality assurance measure, will perform applicable analysis of fill/backfill material samples to verify that the material meets the environmentally clean requirements.

5. Test Borings

The Construction Manager, at its discretion, may take additional test borings. The Contractor shall provide access to site and cooperate with the Construction Manager's boring contractor in completing the borings.

**B. Inspection**

1. Fill and Backfill Compaction: The Construction Manager for Controlled Inspection will give approval for each lift and the adequacy of the subgrade. In the event that the compaction requirements are not satisfied, the lift shall be rerolled or removed and again tested until the required compaction is obtained.
2. Footing Subgrade: The Construction Manager for Controlled Inspection is responsible for approval of bearing capacity for all footings in accordance with paragraph 27-723 of the Building Code.
3. Contractor's Responsibility: The Contractor shall notify the Construction Manager at least 72 hours prior to filling operations and pouring of footings to allow for the Construction Manager to have the appropriate personnel at the site.

C. Responsibility

1. All required testing and/or analysis shall be provided by the Contractor as part of the included Work and costs of this Project.
2. No testing and/or analysis by the Construction Manager shall relieve the Contractor of the responsibility of conforming to the requirements of these specifications
3. Time for the conduction of the tests and/or inspection defined in these specifications shall be considered as part of the Work of this Project and neither extension of time nor additional costs shall be accepted as a result.

3.26 PROTECTION

- A. Protect graded and compacted areas from traffic and erosion. Keep free of trash and debris.
- B. When completed compacted areas are disturbed by subsequent construction or weather, scarify surface, re-shape, and compact to required density prior to further construction.
- C. Where settling is measurable or observable at excavated areas remove surface (pavement, lawn or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible. The Contractor shall perform this work at no additional cost to the City.

END OF SECTION

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**SECTION 316216**

**TIGHT VERTICAL STEEL SHEET PILE**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

The Contractor shall furnish all labor, materials, tools, and equipment, and install the tight vertical steel sheet piles, as required by the Contract Documents.

**1.02 DEFINITIONS**

- A. The term "tight" as used in this Section means watertight.
- B. The term "permanent sheeting" as used in this Section means sheeting that is required to be left in place permanently upon completion of the construction activities.
- C. The term "temporary sheeting" as used in this Section means sheeting that will be removed upon completion of the work item for which it was used.

**1.03 SUBMITTALS**

The following items shall be submitted to the Construction Manager for approval, in accordance with SECTION: SUBMITTALS.

- A. A detailed sheeting and bracing design, including design calculations and complete working drawings and details. The design calculations shall show lateral earth pressure, design of the sheeting and bracing system, including any tiebacks or anchors, and settlement (if any) behind the sheeting due to dewatering. All design drawings and calculations shall be reviewed and signed by a Professional Engineer who is currently registered in the State of New York and who is experienced in designing sheeting systems that are similar to those proposed for this project in material, design, and extent.
- B. A detailed sheet pile installation plan. This plan, as a minimum, shall include a description and schedule of all operations related to the installation of the sheet piles including, but not limited to the following:
  - 1. Sequencing and progression of sheet pile construction.
  - 2. A description of all equipment and materials to be used during construction of the sheeting.
- C. Certificates: Certified copies of mill test reports.
- D. A copy of all daily field quality control records as outlined below in Paragraph 3.04: FIELD QUALITY CONTROL.
- E. A detailed plan for removal of temporary sheeting.

#### **1.04 APPLICABLE STANDARDS**

The publications are referenced to in the text by the basic designation and shall be the latest published version.

- American Society for Testing and Materials (ASTM)
- ASTM A328
- Steel Sheet Piling
- American Welding Society (AWS)
- Structural Welding Code - Steel
- City of New York Building Code

#### **1.05 GENERAL DESIGN REQUIREMENTS**

- A. All sheet piles shall be extended a sufficient distance below the bottom of excavations to prevent heaving. The Contractor shall also use appropriate methods and procedures to prevent boiling.
- B. Where excavation is adjacent to an existing building structure, the sheeting shall be extended to such depth to prevent displacement of the soils that supports the building and foundations. The Contractor shall underpin adjacent building foundations and structures as required by local, state and federal codes and regulations and as directed by the Construction Manager

#### **1.06 QUALITY ASSURANCE**

The Contractor shall have experience and a successful history in installing the specified type of sheet pile system under similar subsurface conditions.

#### **1.07 DELIVERY AND STORAGE**

Steel sheeting shall be stored in orderly groups and blocked during storage to minimize possible distortion of members. Sheeting exhibiting variations beyond mill tolerance limits shall be considered distorted and shall not be permitted to be used.

### **PART 2 - PRODUCTS**

#### **2.01 MATERIALS**

- A. Permanent sheeting shall be new and unused, and conform to the requirements of ASTM A328.

- B. Temporary sheetings shall be new or like-new, and conform to the requirements of ASTM A328.
- C. Tiebacks and Waler Systems: if used, shall be of high-strength steel.

### **PART 3 - EXECUTION**

#### **3.01 GENERAL**

The Contractor shall place all sheeting and bracing, which may be needed to properly and adequately support the sides of all excavations, in a safe and workman-like manner. Special precautions shall be taken where there is additional lateral pressure due to the presence of adjacent buildings or other structures. The sustaining members in the bracing system shall be designed to provide sufficient reaction against the side banks to maintain stability as well as prevent loss of ground adjacent to the excavation. Any movement or bulging which may occur shall be corrected by the Contractor. Any damage resulting from failure of sheeting, inadequate shoring, or temporary supports shall be corrected by the Contractor at no additional cost to the City of New York.

#### **3.02 SHEET PILE INSTALLATION**

- A. All sheeting shall be tight and continuous, driven vertically in place by means of steam, vibratory, pneumatic hammers, or other method as approved by the Construction Manager and as warranted by site conditions. Sheet piling shall be driven in a manner which will not cause serious damage or distortion of the piles. A protective cap shall be used if required to prevent damage to the tops of the piles. The pile hammer shall be kept in proper alignment during driving by means of suitable leads or guides. The Contractor shall avoid damaging piles by overdriving. Any piling which at any time during the Contract period becomes damaged, distorted, displaced or otherwise separated from adjacent piles, shall be removed and replaced by the Contractor. Any subsurface material which prevents successful driving of sheet piling shall be removed by the Contractor.
- B. All sheeting shall be constructed in accordance with the approved installation plan. Each pile shall be installed vertically and shall be properly interlocked with adjacent piles for its entire length. Vertical alignment of each pile or pile group shall be maintained within 20 percent of its length driven below grade.
- C. Welding: All necessary welding shall be done in accordance with requirements of the American Welding Society Code.
- D. Steel sheet piles shall be left in place unless otherwise specified on the Contract Drawings. Steel sheeting to be left in place shall be cut off 2 feet below final grade. Cut off sections shall be disposed of by the Contractor.
- E. The Contractor shall cut the steel sheeting as necessary to allow for the proper installation of piping and conduit.

**3.03 REMOVAL OF TEMPORARY SHEETING**

Upon completion of the work and after backfilling, the Contractor shall remove the temporary sheet piling. All voids caused by withdrawal of sheeting shall be immediately refilled with sand by approved ramming tools and methods especially adapted to that purpose.

**3.04 FIELD QUALITY CONTROL**

The Contractor shall establish and maintain a quality control program for sheet pile placing and driving operations to ensure compliance with Contract requirements. The Contractor shall maintain records of his quality control for all sheet pile construction operations, including, but not limited to, the following:

- A. Placing: The Contractor shall document the vertical and horizontal alignment, and the spacing of sheeting.
- B. Driving: The Contractor shall record the penetration into existing ground of every sheeting if driven singly, or every group of sheeting if multiple sheets are driven at one time. The records shall include driving equipment, the blow count per foot of penetration, location of the sheeting, elevation of existing grade, actual depth of penetration, and other pertinent data.

**END OF SECTION**

SECTION 316223

PILE FOUNDATION

PART 1 – GENERAL

1.01 SCOPE OF WORK

The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install concrete-filled steel closed-end pipe pile foundations at locations specified, unless otherwise indicated.

A. The Work shall include, but not be limited to the following:

1. Complete installation of pile foundation in accordance with the specifications and drawings.
2. Supply and delivery of all materials, equipment, and accessories, excavate obstructions and backfill as required for pile installation.
3. Drilling and spudding as required through obstructions.
4. Placement of concrete as necessary to cast the pile.

B. Perform dynamic pile load test on two piles.

1.02 SUBMITTALS

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

B. Shop Drawings: Show fabrication and installation details for piles, including splices and tip details.

1. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
2. Indicate locations, sizes, type, and arrangement of reinforcement.

C. Welding certificates.

D. Concrete design mixes.

E. Material certificates.

F. Pile-Driving Equipment Data: Include type, make, and rated energy range; weight of striking part of hammer; weight of drive cap; and, type, size, and properties of hammer cushion. Provide results of wave equation analysis of piles (WEAP) demonstrating that selected driving equipment can drive pile to the required depth and design capacity without overstressing the pile.

G. Report of Pile Test Program: Perform dynamic testing of two piles according to ASTM D4945. Refer to the plan drawings for test pile locations. Provide written report confirming driving criteria within 48 hours after performing testing.

- H. Pile-Driving Records: Submit within three days of driving each pile.
- I. Field quality-control reports.

**1.03 QUALITY ASSURANCE**

- A. Reference Standards: Comply with the latest edition of the applicable provisions and recommendations of the following, except as otherwise shown or specified:
  - 1. Comply with requirements in ACI 301, "Specifications for Structural Concrete."
  - 2. AWS D1.1/D1.1M, "Structural Welding Code - Steel".
  - 3. ASTM A82, Specifications for Steel Wire, Plain, for Concrete Reinforcement.
  - 4. ASTM C33, Specifications for Concrete Aggregates.
  - 5. ASTM 1150, Specifications for Portland Cement.
  - 6. ASTM D4945, Standard Test Method for High-Strain Dynamic Testing of Deep Foundations.
- B. Definitions:
  - 1. Production Piles: Production piles are the piles installed and incorporated into the permanent Work after the load tests are completed by the Contractor and the results reviewed and accepted by the Engineer. Where a test pile is shown to meet the required loads, it shall be considered a production pile.
- C. A representative of NYCDDC will provide the required testing.
- D. Qualifications of Pile Contractor:
  - 1. The pile Contractor shall have no less than five (5) years of experience in installation of type of pile to be used and completed not less than three (3) successful pile foundation projects under similar job and subsurface conditions.
  - 2. The Contractor's superintendent shall have a minimum of five (5) years' experience in installation of type of pile to be used.
- E. High-strain dynamic load testing for pile capacity shall be performed on two piles, per ASTM D4945. Independent Testing Agency shall perform all instrumentation for pile load tests, shall direct the test drives, and shall interpret test results.
- F. Welding Qualification: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code – Steel."
- G. Preinstallation Conference: Conduct conference at Project site.

**1.04 PROTECTION OF EXISTING STRUCTURES**

- A. The effect of piling operations on adjacent existing structures and utilities shall be monitored by the Contractor. Assessing the condition of these structures and utilities and taking the necessary precautions to protect these structures and utilities shall be the

responsibility of the Contractor. The Contractor shall submit to the Engineer for review such methods or precautions to be taken to prevent such damage.

- B. The Contractor shall be responsible for the temporary relocation, repair or replacement of any damage caused to existing utilities and facilities as a result of the piling operation. This work shall be done at the Contractor's expense.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver piles to Project site in such quantities and at such times to ensure continuity of installation. Handle and store piles at Project site to prevent buckling or physical damage.

**1.06 PROJECT CONDITIONS**

- A. Geotechnical soil borings and laboratory testing were performed for this project and are included in the Contract Documents for informational purposes only. Contractor shall verify all geotechnical information necessary for proper performance of the work.

**PART 2 - PRODUCTS**

**2.01 STEEL PIPE PILES**

- A. High-Strength, Low-Alloy, Structural Steel: ASTM A 588/A 588M, 50 ksi yield strength.
- B. Piles shall have minimum outside diameter of 16-inches and minimum pipe wall thickness of 0.5-inches. Piles shall have closed ends.

**2.02 FABRICATION**

- A. Fabricate and assemble piles in shop to greatest extent possible.
- B. Pile-Length Markings: Mark each pile with horizontal lines at 12-inch intervals; label the distance from pile tip at 60-inch intervals. Maintain markings on piles until driven.

**2.03 CONCRETE MATERIALS**

- A. Provide concrete per Section 033000.

**2.04 PILE ACCESSORIES**

- A. Splice Coupling: Manufacturer's standard splice coupling, with interior stop and internally tapered for friction fit driving.

**PART 3 - EXECUTION**

**3.01 EXAMINATION**

- A. Site Conditions: Do not start pile-driving operations until earthwork fills have been completed or excavations have reached an elevation of 6 to 12 inches above bottom of footing or pile cap.

**3.02 DRIVING EQUIPMENT**

- A. Pile Hammer: Air-, steam-, hydraulic-, or diesel-powered type capable of consistently delivering adequate peak-force duration and magnitude to develop the ultimate capacity required for type and size of pile driven and character of subsurface material anticipated. An appropriate hammer shall be selected by the Contractor based on a wave equation analysis (WEAP).
- B. Hammer Cushions and Driving Caps: Between hammer and top of pile, provide hammer cushion and steel driving cap as recommended by hammer manufacturer and as required to drive pile without damage.
- C. Leads: Use fixed, semifixed, or hanging-type pile-driver leads that will hold full length of pile firmly in position and in axial alignment with hammer.

**3.03 DRIVING PILES**

- A. General: Continuously drive piles to elevations and/or penetration resistance given on the Drawings or as required by the Engineer. Engineer will establish final driving criteria on the basis of dynamic load testing as required herein. Establish and maintain axial alignment of leads and piles before and during driving.
- B. Heaved Piles: Redrive heaved piles to tip elevation at least as deep as original tip elevation with a driving resistance at least as great as original driving resistance.
- C. Pile Splices: Splice piles during installation and align pile segments concentrically. If spliced after driving a segment, splice piles at least 3 ft above the ground.
- D. Driving Tolerances: Drive piles without exceeding the following tolerances, measured at pile heads:
  - 1. Location: 4 inches (102 mm) from location indicated after initial driving, and 6 inches (152 mm) after pile driving is completed.
  - 2. Plumb: Maintain 1 inch (25 mm) in 4 feet (1.2 m) from vertical, or a maximum of 4 inches (102 mm), measured when pile is aboveground in leads.
- E. Withdraw damaged or defective piles that exceed driving tolerances and install new piles at a new location specified by Engineer within driving tolerances. Fill holes left by withdrawn piles with cohesionless soil material or grout, as approved by the Engineer.



- F. Cutting Off: Tops of piles shall be cut-off square with the pile axis at the elevations indicated on the Plans, by removing fresh concrete from the top of the pile or by cutting off hardened concrete down to the final cutoff point at any time after initial set has occurred. The finished top of pile shall be no more than 1 in. (25 mm) below or 3 in. (75 mm) above the elevation shown on the Plans.

### 3.04 CONCRETE PLACEMENT

- A. Prior to placing concrete, remove accumulated water or other foreign material from pipe pile.
- B. Place concrete in a continuous operation and without segregation immediately after cleaning out pile.

### 3.05 PILE DRIVING RECORDS

- A. Maintain accurate driving records for each pile, compiled and attested to by a qualified professional engineer. The Contractor shall maintain accurate records for each pile constructed and shall provide copies of these records to Engineer as specified herein. Pile records shall show:
1. Weather conditions, including air temperature, at time of concrete placement;
  2. Pile location; Type, make, model, and rated energy of hammer; Weight and stroke of hammer.
  3. Ground surface elevation (reference grade for pile length);
  4. Pile toe (bottom) depth and elevation;
  5. Final pile top elevation, after cut-off.
  6. Elevation of top of grout or concrete;
  7. Pile length;
  8. Number of blows for every 12 inches of penetration, and number of blows per 1 inch for the last 12 inches of driving.
  9. Pile deviations from location and plumb.
  10. Date/Time of beginning of driving;
  11. Date/Time of completion of driving;
  12. Date/Time concrete was mixed;
  13. Date/Time ready-mix concrete truck arrived at project site, and copies of all concrete batch tickets used for the pile construction;
  14. Date/Time of beginning of concrete pumping;
  15. Date/Time of completion of concrete pumping;
  16. Unusual occurrences during pile driving, including the depth of any obstructions encountered and how obstruction was overcome.

### 3.06 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
1. Pile Foundations.

**B. Tests and Inspections:**

1. **Dynamic Pile Testing:** A representative of NYCDDC will provide testing. Tests shall be performed and reported according to ASTM D 4945 on a minimum of two test piles. The test piles correspond to production piles used for the project. Specific piles scheduled for testing as well as test loads are indicated on the Drawings. Perform dynamic testing on the test pile during initial drive.
  - a. All load tests shall be conducted in the presence of the Engineer.
  - b. Interpretation of test results and determination of pile capacity shall be made by the NYCDDC's representative and reviewed by the Engineer.
  - c. Interpretation of test results and determination of pile capacity shall be made by the NYCDDC's representative. Driving criteria shall be established on the basis of CAPWAP analyses. NYCDDC's representative shall provide Engineer with a written report summarizing the test program and results and providing driving criteria. Engineer will review and approve the results.
  - d. Contractor may install production piles at its own risk during the interim between the initial drive of the test piles and the establishment of driving criteria. Production piles installed during the interim shall be driven to tip depth no lower than 5 ft above the anticipated tip depth shown on the Plans. Production piles driven in the interim will be restruck as necessary to achieve the required capacity on the basis of the driving criteria established from the results of the test piles.
2. **Weld Testing:** In addition to visual inspection, welds shall be tested and inspected according to AWS D1.1/D1.1M and inspection procedures listed below, at testing agency's option. Correct deficiencies in Work that test reports and inspections indicate do not comply with the Contract Documents.
  - a. Liquid Penetrant Inspection: ASTM E 165.
  - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
  - c. Ultrasonic Inspection: ASTM E 164.
3. **Concrete:** Sampling and testing of concrete for quality control shall include the following:
  - a. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94/C 94M.
  - b. Slump: ASTM C 143/C 143M.
  - c. Compressive-Strength Tests: ASTM C 39/C 39M; one set for each truck load. One specimen shall be tested at seven days, two specimens shall be tested at 28 days, and one specimen shall be retained in reserve for later testing if required.

**3.07 DISPOSAL**

- A. Remove withdrawn piles and cutoff sections of piles from site and legally dispose of them off Owner's property.

END OF SECTION

**NO TEXT ON THIS PAGE**

**SECTION 320000**

**SURFACE RESTORATION**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

The Contractor shall furnish all labor, materials, tools and equipment, and perform all operations necessary to restore disturbed areas to a condition equal to or superior to, that which existed prior to the commencement of construction in accordance with the requirements of this Section.

**1.02 RELATED WORK**

SECTION: DEMOLITION  
SECTION: EXCAVATION  
SECTION: FILLING, BACKFILLING AND COMPACTING FOR STRUCTURES  
SECTION: ASPHALT CONCRETE PAVING  
SECTION: CAST IN-PLACE CONCRETE

**1.03 APPLICABLE REFERENCES**

A. The publication listed below forms a part of this Specification to the extent referenced. The publications are referenced to in the text by basic designation and shall be the latest published version.

1. New York City Department of Transportation (NYCDOT) Bureau of Highway Operations, Standard Specifications.

**1.04 INTENT OF SPECIFICATIONS**

All materials furnished shall match existing conditions as closely as possible.

**1.05 SUBMITTALS**

The Contractor shall submit to the Construction Manager six (6) full sets of Proposed Restoration Plans to refurbish the facility to a condition equal to or better than that which existed prior to remedial work.

**1.06 WEATHER LIMITATIONS**

Unless otherwise directed, bituminous courses shall not be constructed when the temperature of the surface of the existing pavements or base course is below 50 degrees F.

**PART 2 - PRODUCTS**

**2.01 GENERAL**

The Contractor shall submit adequate information to the Construction Manager to certify that materials proposed for use shall meet these Specifications.

**PART 3 - EXECUTION**

**3.01 ASPHALTIC CONCRETE PAVEMENT RESTORATION**

- A. As soon as the structure in any trench or opening made within a street is completed, the trench or opening shall be backfilled, and maintained to the satisfaction of the Construction Manager.
- B. The surface to be paved shall be prepared and compacted so as to form a dry, firm, uniform surface parallel to and at the required distance below the finished surface, to the satisfaction of the Construction Manager.
- C. The foundation course shall be thoroughly compacted and bonded to a firm, even surface conforming to the grade and crown of the street. The voids in the 1-1/2 inch broken stone shall be filled with screenings or sand before rolling. Where the foundation course cannot be reached by a roller, a concrete foundation course may be substituted for the layer of 1-1/2-inch broken stone, but no additional allowance shall be made on account of the concrete foundation course. The foundation course shall be a minimum of 2 inches in thickness after thorough compaction. The wearing course of bituminous binder and mineral aggregate shall be thoroughly compacted by rolling. Areas that cannot be reached by a roller shall be thoroughly compacted by tamping. The wearing course shall have a total thickness of not less than two inches after thorough compaction.
- D. The surface of the pavement shall be hard, dry and smooth, and shall be maintained at all times in that condition. The Contractor shall promptly fill in all depressions with additional material similar to that used in the wearing course, and reroll until the surface is again uniform and at the required grade.
- E. Street surfaces over openings made for the purpose of installing and removing collection systems, for rearranging subsurface structures and for building collection systems and other structures outside of the main trench for the Project, shall be restored as soon as practicable, as determined by the Construction Manager, to a condition similar to and equally as good as that existing at the time of commencement of the work hereunder.
- F. Unless otherwise specifically directed, pavements restored shall line up with existing adjacent surfaces and shall be similar to that existing at the time of commencement of the work hereunder, provided, however, that the following requirements are met:
  - 1. Areas in which the existing roadway pavement is sheet asphalt shall, in general, be restored with a pavement consisting of three inches of asphaltic concrete on a 6-inch concrete base.

2. Areas in which the existing roadway pavement is brick or block shall, in general, be restored with a pavement consisting of brick or block on a 6-inch concrete base.
  3. Areas in which existing roadway pavement is concrete shall, in general, be restored with a pavement of concrete at least as thick as that existing. In no event, however, shall the concrete pavement provided be less than 6 inches thick.
- G. Areas to be restored shall include the areas disturbed plus the adjoining pavement that has been damaged or otherwise affected. Such adjoining pavement shall first be saw cut and removed. To prevent settlement and to secure a proper bond with the new concrete, the concrete base shall be removed to at least 6-inches beyond the outer limits of the subgrade disturbed, and all contact surfaces of the existing concrete shall be cleaned and coated with a grout of Portland Cement. The wearing surface shall be restored over an area extending at least three inches beyond the outer limits of the new concrete. When the distance between trenches is 7 feet or less, the wearing course between such trenches shall be removed and restored integrally with the wearing course over the restored trenches.

### 3.02 CURBS

- A. When required by the Construction Manager, the Contractor shall furnish and set or construct at locations as may be required, new curb. However, all of the old curbstone removed which is, in the opinion of the Construction Manager, in condition for relaying shall be preserved and restored.
- B. Steel facing for street curbs shall conform to City of New York Parks and Recreation Standard.

### 3.03 SURFACE OUTSIDE LINES TO BE RESTORED

All street and other surfaces (including the foundations thereof) outside the pavement lines of excavation, except as herein otherwise specifically provided for, either adjacent to or not adjacent to the line of the Project that may have become damaged, directly or indirectly, as a result of the Contractor's operations, shall be restored by the Contractor at his expense, to a condition equal to or better than that existing previous to the commencement of construction.

### 3.04 LANDSCAPE

All landscape areas (including lawns, trees and shrubs) on and off the property that may have become damaged, directly or indirectly, as a result of the Contractor's operations, shall be restored by the Contractor at his expense to a condition equal to or better than that existing previous to the commencement of construction.

**3.05 MASONRY**

Masonry areas that have become damaged as a result of the Contractor's operations, shall be restored by the Contractor to a condition equal to or better than that existing previous to the commencement of construction.

**END OF SECTION**



**SECTION 321200**

**ASPHALTIC CONCRETE PAVING**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

The Contractor shall furnish all labor, materials, tools, and equipment and complete the asphaltic concrete paving work, as required by the Contract Documents.

**1.02 SUBMITTALS**

The following items shall be submitted to the Construction Manager for review and approval.

- A. Proposed job-mix formula including complete data on materials, source, locations, percentages, temperatures, and all other data deemed pertinent by the NYCDOT.
- B. The Contractor shall certify that the paving materials meet NYCDOT standard specifications material requirements. Certificate(s) shall be signed, stamped, and dated by the Contractor and shall include data for the following:
  - 1. Coarse and fine aggregates from each material source and each required gradation.
  - 2. Asphalt or tar cement for each penetration grade.
  - 3. Job-mix design mixtures for each material or grade.
  - 4. Density of uncompacted and compacted asphalt concrete.
  - 5. Density and voids analysis for each series of asphalt concrete mixture test specimen.
  - 6. Asphalt concrete plant inspection.
- C. The Contractor's proposed methods and equipment for paving and grade control.

**1.03 APPLICABLE STANDARDS**

The publications are referenced by basic designation and shall be the latest published version.

- American Society for Testing Materials (ASTM)

ASTM D1188 Standard Method of Test for Bulk Specific Gravity of Compacted Bituminous Mixtures Using Paraffin Coated Specimen  
ASTM D3515 Specifications for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures

ASTM D8027     Standard Specifications for Liquid Asphalt

ASTM D9777     Standard Specification of Emulsified Asphalt

- New York City Department of Transportation (NYCDOT) Bureau of Highway Operations, Standard Specifications.

NYCDOT (Section 6.67)     Subbase Course, Select Granular Material

NYCDOT (Section 3.01)     Asphalt Paving Mixtures

NYCDOT (Section 4.02)     Wearing Course, Asphaltic Concrete and Sheet Asphaltic

## **PART 2 - PRODUCTS**

### **2.01     MATERIALS**

- A.     Crushed Stone Sub-base Course: Crushed stone sub-base course shall conform to NYCDOT Section 6.67 and shall contain no blast furnace slag. Thickness shall be a minimum of 8 inches unless otherwise shown or approved.
- B.     Binder Course: Binder course shall consist of a bituminous stabilized granular material, conforming to NYCDOT Section 3.01. Thickness shall be three (3) inches unless otherwise shown or approved.
- C.     Top Course: Top course shall conform to NYCDOT Section 4.02. Thickness shall be a minimum of two (2) inches unless otherwise shown or approved.
- D.     Asphaltic Concrete Paving shall be hot-laid plant mix (hot mix).

### **2.02     MATERIAL QUALITY TESTING**

Material quality tests for asphaltic concrete and crushed stone courses shall be in accordance with NYCDOT Standard Specifications, dated June 1986 and all revisions.

## **PART 3 - EXECUTION**

### **3.01     GENERAL REQUIREMENTS**

- A.     The pavements shall be full-depth, hot-plant-mixed, hot-laid asphalt and aggregated mixture laid in multiple courses on compacted subbase and shall consist of layers as shown on drawings or as otherwise approved by the Construction Manager. Subbase compaction shall be in accordance with the requirements of NYCDOT Standard Specifications Section 6.67.
- B.     Straightedge: The Contractor shall furnish and maintain at the site, in good condition, one 10-foot straightedge for each bituminous paver. Straightedge shall be made available for Construction Manager's use. Straightedges shall be constructed of aluminum or other

lightweight metal and shall have blades of box or box-girder cross section with flat bottom reinforced to insure rigidity and accuracy. Straightedges shall have handles to facilitate movement on pavement.

- C. Weather Limitation: Unless otherwise directed, bituminous courses shall not be constructed when temperature of the surface of the existing pavement or base course is below 50 degrees F. Bituminous courses shall be constructed only when they are dry and there is no rain occurring.
- D. Protection of Pavement: After final rolling, of the pavement, no vehicular traffic of any kind shall be permitted on the pavement until the pavement has cooled and hardened for at least six (6) hours.
- E. Grade and Surface-Smoothness Requirements: The finished surface course, upon completion of final rolling, shall be smooth and true to grade and cross section. When a 10-foot straightedge is laid on the surface parallel with the centerline, the surface shall not vary more than 1/8 inch from the straightedge. When the 10-foot straightedge is laid on the surface transverse to the centerline between the crown and edge of payment, the surface shall not vary more than 1/4 inch from the straightedge. Low or defective areas shall be immediately corrected by cutting out the faulty areas and repaving with fresh, hot mixture, and compacting the area to conform to the remainder of the pavement. Testing for plan-grade conformance and surface smoothness shall be performed by the Contractor, in the presence of the Construction Manager, immediately after rolling is completed. Tests shall be made at intervals as directed by the Construction Manager.
- F. The Construction Manager may perform tests on in place material if he has cause to suspect there is nonconformance with these specifications. The Contractor shall assist the Construction Manager in testing and shall make no claim for additional payment nor for extension of contract time for such work. The Construction Manager's testing will be at his own expense. However, the Contractor shall be responsible for all lab test costs and material replacement, should the testing prove material nonconformance.

### 3.02 INSPECTION

- A. The Contractor shall inspect and notify the Construction Manager, prior to the start of paving, of conditions detrimental to the installation of the pavements. Paving operations shall not start without the Construction Manager's approval.
- B. The surface of the binder course shall be a clean surface, free of excess or spilled bituminous materials and all foreign matter to receive the top course. The Contractor shall prepare and treat the binder course surface with bituminous tack coat at application in quantities not less than 0.05 gallon per square yard nor more than 0.15 gallon per square yard on all areas deemed by the Construction Manager as deficient, prior to receiving the top course, at his own expense and in accordance with NYCDOT Section 4.02.

**3.03 INSTALLATION OF PAVEMENTS**

- A. **Transportation of Bituminous Mixture:** Transportation from paving plant site shall be in trucks having tight, clean, smooth beds lightly coated with releasing agent to prevent adhesion of the mixture to the truck bodies. Excessive releasing agent shall be drained prior to loading. Each load shall be covered to protect mixture from weather and prevent loss of heat. Loads that have crusts of cold, unworkable material or that have become wet will be rejected. Hauling equipment and vehicles over freshly placed material will not be permitted.
- B. **Surface Preparation:** Prior to placing of the bituminous courses, the underlying course shall be cleaned of all foreign or objectionable matter with power brooms and hand brooms. Bituminous courses shall be constructed only when the sub-base course has no free water on the surface. A tack coat shall be applied between the courses in accordance with the NYCDOT Standard Specifications.
- C. **Preparation of the paving mixtures, the type of paving equipment, placing procedures, and compacting procedures shall be in accordance with approved submittals and NYCDOT Standard Specifications, unless otherwise approved by the Construction Manager.**
- D. **Equipment:**
  - 1. **General:** Paving equipment shall include bituminous pavers, rolling equipment, and hand tools.
  - 2. **Mechanical Spreader:** Mixtures having temperatures less than 235 degrees F. when dumped into the mechanical spreader shall not be used. The mechanical spreader shall be adjusted and the speed regulated so that the surface of the course being laid will be smooth and continuous without tears and pulls, and of such depth that, when compacted, the surface will conform to the cross section indicated. Placing with respect to centerline areas with crowned sections or high side of areas with one-way slope shall be as specified or approved. Each lot of material placed shall conform to requirements specified herein. Placing of the mixture shall be as nearly continuous as possible, and speed of placing shall be adjusted or as directed to permit proper rolling. When segregation occurs in the mixture during placing, the spreading operation shall be suspended until the cause is determined and corrected.
- E. **Placing procedures for asphaltic concrete courses shall include paver placing, hand placing, spreading, tamping, and jointing. In areas where the use of machine spreading is impractical, the mixture shall be spread by hand. Spreading shall be in a manner to prevent segregation. The mixture shall be spread uniformly with hot rakes in a loose layer of thickness that, when compacted, will conform to required grade, density, and thickness.**
- F. **Compacting procedures for asphaltic concrete courses shall include breakdown rolling, second rolling, and finish rolling.**

**G. Compaction:**

1. Rolling shall begin as soon after placing, as the mixture will bear a roller without undue displacement. Delays in rolling freshly spread mixture will not be permitted.
2. After initial rolling, preliminary tests of crown, grade, and smoothness shall be made by the Contractor. Deficiencies shall be corrected so that the finished course will conform to requirements for grade and smoothness specified herein. Crown, grade, and smoothness shall be checked in each lot of completed pavement by the Contractor and will be evaluated by the Construction Manager for compliance.
3. After the Contractor is assured of meeting crown, grade, and smoothness requirements, rolling shall be continued until a mat density of 97.0 to 100.0 percent and a joint density of 95.0 to 100.0 percent of density of laboratory-compacted specimens of the same mixture is obtained. The density shall be determined for evaluation by the Contractor's approved laboratory.
4. Places inaccessible to rollers shall be thoroughly compacted with approved hot hand tampers.

- H.** Crushed stone paving course shall be placed in lifts no greater than 12 inches compacted thickness. The Contractor shall maintain the moisture content of the material so that compaction is not hindered. Crushed stone course shall be compacted to sustain vehicles and equipment with no excessive rutting or other particle displacement.

**3.04 CORRECTION OF DEFICIENT AREAS**

Mixtures that become contaminated or are defective as judged by the Construction Manager shall be removed to the full thickness of the course. Edges of the area to be removed shall be cut so that sides are perpendicular and parallel to the direction of traffic and so that the edges are vertical. Fresh paving mixture shall be placed in the excavated areas in sufficient quantity so that the finished surface will conform to grade and smoothness requirements. Paving mixture shall be compacted to the density specified herein before. Skin patching of an area that has been rolled will not be permitted.

**3.05 REPLACING PAVEMENT AND RELATED AREAS**

- A.** The Contractor shall replace to their existing condition existing pavements and other structures disturbed, damaged, or destroyed by his operations at no additional cost to the Owner, unless the pavement replacement is specified or shown on the drawings. All materials and methods of construction for restoration or replacement shall conform to the specifications or directions of the public authority having jurisdiction.
- B.** Asphaltic concrete pavement for patching shall match existing thickness or have minimum total thickness of 5 inches: 3 inches of binder and 2 inches top course. All existing asphalt pavement shall be evenly saw cut as shown on the drawings to provide a shoulder of undisturbed base material.

- C. Asphaltic concrete shall be transported from the mixing plant to the site in suitable trucks covered with a tarp to prevent loss of heat.
- D. Placing: The underlying base course shall be cleaned of all foreign matter before placing new asphalt. A tack coat is required between the intermediate and surface course, unless specifically approved, due to the recent placement of the underlying course or if it is entirely free of dust and foreign matter.
- E. Spreading: In areas where the use of machine spreading is impractical, the mixture shall be spread uniformly with hot shovels and hot rakes in a loose layer of a thickness that, when compacted, will conform to the required grade and thickness. During hand spreading, each shovelful of mixture shall be carefully placed by turning the shovel over in a manner that will prevent segregation. In no case shall the mixture be placed by throwing or broadcasting from a shovel. The loads shall not be dumped faster than can be properly handled by the shovelers and rakers.
- F. Compaction: Compaction of the mixture shall be accomplished by approved steel-wheel rollers and pneumatic-tired rollers. Rolling shall begin as soon after placing as mixture will bear roller without undue displacement. Delays in rolling freshly spread mixture will not be permitted. After initial rolling, preliminary tests of crown, grade, and smoothness shall be made by the Contractor in the presence of the Construction Manager. Before rolling is continued, deficiencies shall be corrected so that finished course will conform to requirements for grade and smoothness specified herein. Further smoothness checks shall be made by the Contractor as directed by the Construction Manager. After preliminary smoothness tests, rolling shall be continued until density is obtained in all portions of each course of not less than 95 percent of density of laboratory compacted specimens of same mixture.
- G. If construction is performed between October 1 and April 1, the Contractor is required to provide four (4) inches, of cold patch for all pavement cuts.
- H. Approved equal or same materials shall be used for features to be replaced or restored to the same lines, grades, dimensions, cross sections, and profiles as originally existed.

**3.06 JOINTS**

- A. General: Joints between old and new pavements, between successive days' work, or joints that have become cold (less than 175 degrees F.) shall be made to insure continuous bond between the old and new sections of the course. All joints shall have the same texture and smoothness as other sections of the course. Contact surfaces of previously constructed pavements coated by dust, sand, or other objectionable material shall be cleaned by brushing or shall be cut back as directed. The wearing course shall be placed so that longitudinal joints of the wearing course will be offset from joints in the binder course by at least one (1) foot. Transverse joints in the wearing course shall be offset by at least two (2) feet from transverse joints in the binder course.
- B. Placing Strips Succeeding Initial Strips: In placing each succeeding strip after initial strip has been spread and compacted as specified below, the spread of the mechanical spreader shall overlap the previously places strip 2 to 3 inches and be sufficiently high so that

compaction produces a smooth dense joint. Mixture placed on the edge of a previously placed strip by the mechanical spreader shall be pushed back to the edge of the strip by use of a lute. Excess mixture shall be removed and wasted.

- C. Transverse Joints: The roller shall pass over the unprotected end of a strip of freshly placed material only when placing is discontinued or delivery of the mixture is interrupted to the extent that the material in place may become cold. In all cases, prior to continuing placement, the edge of previously placed pavement shall be cut back to expose an even vertical surface for full thickness of the course. In continuing placement of a strip, the mechanical spreader shall be positioned on the transverse joint so that sufficient hot mixture will be spread to obtain a joint after rolling that conforms to the required density and smoothness specified herein.
- D. Longitudinal Joints: Edges of a previously placed strip shall be prepared such that the pavement in and immediately adjacent to the joint between this strip and the succeeding strip meets the requirements for grade, smoothness, and density.

END OF SECTION

**NO TEXT ON THIS PAGE**



SECTION 332000

WELL CONSTRUCTION

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, materials, tools, equipment, and services required for Construction of the following: groundwater monitoring and extraction wells, soil vapor extraction wells, air inlet (or ventilation) wells, product recovery wells, pumping wells, Micro-Organism Injection Wells, ORC injection wells and borings, chemical oxidation injection wells and borings, and all other incidental work necessary to complete the installation of the wells/borings as indicated on the Contract Drawings, specified herein, or as directed by the Construction Manager.

1.02 RELATED WORK

SECTION:	SURVEY REQUIREMENTS
SECTION:	REMOVAL AND DISPOSAL OF REGULATED WASTE
SECTION:	FILLING, BACKFILLING AND COMPACTING FOR STRUCTURES
SECTION:	SURFACE RESTORATION

1.03 WELL DESIGN/BORING ADVANCEMENT

- A. The Contractor shall ensure that all wells/borings will meet the intended requirements of the remedial system as indicated in the Contract Specifications and on the Contract Drawings. The Contractor shall determine the thickness of various geologic units and depth to the water table at each site.
- B. The intended requirements of the wells/borings shall be as indicated in the Contract Specifications, the Contract Drawings, and as specified by the Construction Manager.
- C. The Contractor shall provide written verification to the Construction Manager that the soils at each well/boring location are in accordance with the expected conditions determined during previous investigative activities.
- D. The Contractor shall provide written verification that the specified slot size and filter material gradation indicated on the Contract Drawings will adequately provide the uptime requirements for the well as indicated in the Contract Specifications, as specified herein, or as directed by the Construction Manager prior to the construction and installation of the well.

1.04 SUBMITTALS

The following items shall be submitted by the Contractor to the Construction Manager for review and approval.

- A. **Contractor Qualifications:** An experienced driller shall be used to perform and complete the well construction and installation. The driller shall have the appropriate classification, certifications, and qualifications in accordance with all local, state, and federal regulations. The Contractor shall submit evidence that the driller meets these requirements, and shall not be permitted to start well drilling without the approval of the Construction Manager. All drilling and well construction and installation shall be performed under the direction of an experienced, qualified, and competent geologist or geotechnical engineer approved by the Construction Manager.
- B. **Well Construction Method:** The Contractor shall submit a proposed plan for drilling, construction, installation, and development of wells for approval by the Engineer prior to the commencement of any drilling activities. The plan shall take into account all the information furnished and all the restrictions imposed by the Contract Documents. Prior to drilling, the Contractor shall take appropriate steps to ensure that buried utilities, subways and other manmade structures are not impacted by the advancement of equipment. These steps shall include, but are not limited to, hand digging, probing and vacuum methods to be employed from the surface and extending at least five feet below grade. The Contractor also shall use utility call out services prior to the commencement of drilling activities.
- C. **Boring Logs/Well Construction Diagrams:**
1. The Contractor shall keep an accurate boring log of the materials encountered during drilling. The Contractor's approved and qualified geologist or geotechnical engineer shall prepare each boring log. The boring log shall have a description of all material that includes ASTM classification, consistency, moisture content, and color.
  2. All boring logs shall show depth to the water table and each geologic formation. Boring logs shall include photoionization detector (PID) readings for continuous split spoon samples (unless otherwise approved by the Construction Manager), blow counts for the split spoon samples, and the recovery percentage of the split spoon samples. The Contractor may request an example boring log that details the required information from the Construction Manager. The Contractor shall submit the boring log format for approval by the Engineer.
  3. The Contractor shall submit well construction diagrams to the Construction Manager for each constructed and installed well. The well construction diagram shall include the following information: a cross-section log drawn so as to depict the installation as it exists in the ground and include a log of material copied from the original boring log to the left of the cross-section; depth and type of well casing, description of well screen (including length, location, diameter, slot size, material); gradation and description of filter pack and placement method including how depth to the top of the filter was determined; placement method of seal including material hydration time, water content and mix ratios for grout; construction details, including any difficulties setting casing and screen and sounding procedures for determining well depth; manufacturer and quantities of all materials used in wells, and hole preparation before installation of well. The Contractor may request an example well construction diagram that details the

required information from the Construction Manager. The Contractor shall submit the well construction diagram format for approval by the Engineer.

- D. Shop Drawings: The Contractor shall submit detailed shop drawings and catalog data for the screen, casing, protective casing and lockable cap, filter material, and joints proposed for approval by the Engineer.
- E. Filter Material and Sieve Analysis: A sieve analysis shall be submitted to the Construction Manager in advance of delivery and placement of the filter material for the pumping and product recovery wells. Samples of filter material shall be submitted by the Contractor upon request.
- F. Water Quality: The Contractor shall use potable water for all drilling and grouting.
- G. Development Records: The Contractor shall submit documentation of well development which includes elapsed time between grouting and well development, specific details of development including time duration of each action, description of development water, and evidence of cement or grout. Refer to well development requirements specified herein for other relevant information.
- H. Survey Coordinates: The Contractor shall survey each installed well in accordance with SECTION: SURVEY REQUIREMENTS. The Contractor shall submit the survey coordinates for each installed well to the Construction Manager and the Commissioner. Survey coordinates shall be State Plane NAD83 New York East. Soil boring locations shall be determined using measurements from at least two existing wells.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

Unless otherwise indicated in the site specific Contract Drawings and Contract Specifications, the following materials shall be used in construction and development of the wells:

- A. Temporary Well Casing: Temporary well casing shall be used as required, to support an open borehole to permit the installation of the inner collection well casings.
- B. Well Casing and Screen: Wells shall be constructed of 1-inch, 2-inch, 4-inch, 6-inch, 8-inch, and 12-inch diameter type 304 stainless steel pipe or Schedule 40 or 80 polyvinylchloride (PVC) pipe in full compliance with AWWA C-900, latest edition. The type of well pipe used will be as indicated on the Contract Drawings. The bottom section of the well pipe shall consist of a well screen. The slot opening and length of well screen shall be as indicated on the Contract Drawings. The Contractor shall verify that the slot opening indicated on the Contract Drawings is adequate for the pumping and product recovery wells by sieve analysis as specified herein.
- C. Filter Pack: Filter pack material shall be washed gravel or clean sand free of contaminants and silt. The grain size of the gravel/sand pack to be used shall be selected to be compatible with the slot openings of the well screen and the existing surrounding soil. For the pumping wells and product recovery wells, the filter pack material indicated on the

Contract Drawings shall be verified to ensure that it is adequate for the on-site soil conditions by sieve analysis as specified herein, and as directed by the Construction Manager.

- D. **Precast Concrete Chamber and Manholes:** Precast concrete chambers used to protect the well shall be fabricated to accommodate H-20 loadings. The walls, base and interior chamber measurements shall be as indicated on the Contract Drawings. The precast structure shall be fabricated with openings to accommodate effluent lines, wires, conduit, etc. as shown on the Contract Drawings.
- E. **Precast Steel Protective Casing:** Precast steel flush mount casings shall be provided with a rubber gasket to prevent infiltration of surface runoff into the casing annulus as indicated on the Contract Drawings.
- F. **Frame and Cover:** The galvanized frame and solid locking cover of precast concrete chambers shall accommodate H-20 loadings. The frame and cover shall be submitted to the engineer and construction manager for approval.

### PART 3 - EXECUTION

#### 3.01 GENERAL

- A. During drilling, continuous split soil samples shall be collected every two (2) feet for borings that are equal to or less than 30 feet below ground surface, and every five (5) feet for borings that are greater than 30 feet below ground surface unless specified otherwise by the Construction Manager.
- B. All materials entering well borings, shall be free of contamination of any kind.
- C. The Contractor shall protect all surface and subsurface structures, including utilities during the progress of work; shall remove from well location all cuttings, drilling, debris and unused materials; and shall, upon completion of his work, restore site to a condition equal to or better than the original condition. Cuttings and related debris shall be disposed of in accordance with applicable regulations.
- D. Unless otherwise directed by the Construction Manager, all wells shall be located at the locations shown on the Contract Drawings.
- E. All constructed and installed wells shall be surveyed for location and elevation, and in accordance with SECTION: SURVEY REQUIREMENTS. All soil boring locations shall be determined by measurements from at least two existing wells.

#### 3.02 WELL CONSTRUCTION

Unless otherwise indicated in the Contract Specifications and Contract Drawings, the wells shall be constructed and developed as described below:

- A. **Bore Hole:** The borehole diameter shall not be any larger than necessary to construct the well consistent with drilling method, and shall be as indicated on the Contract Drawings. If

drilling mud is required, only bentonite mud shall be used. Organic degradable type drilling fluid shall not be permitted. Lubricants on down-hole tools and equipment shall not be used without prior approval of the Construction Manager.

- B. Temporary Casing: Any temporary casing shall have an inside diameter large enough to provide a 2-inch minimum filter thickness entirely around the screen and shall have sufficient thickness to retain its shape and maintain a true section throughout its depth. The temporary casing shall be such as to permit its removal without damaging or interfering with the filter or permanent casing.

- C. Depth and Diameter of Well: Wells shall be constructed to the depth and of the diameter as indicated on the Contract Drawings, or as specified by the Construction Manager.

- D. Decontamination Between Bore Holes: All drilling tools, including hollow stem augers, drill pipe, drill bits, casings, screens, weighted tapes and probes, shall be steam cleaned between well locations for all wells. Decontamination shall be performed as required by the Contractor's QA/QC Plan. The water generated during decontamination shall be collected and disposed of in accordance applicable regulations.

- E. Cause for Abandonment:

1. Loss of a hole or well because of lack of material, inadequate or faulty equipment, or careless operating procedures will be considered cause for an abandoned well due to fault or neglect on the part of the Contractor.
2. In the event that any well should require abandonment due to improper installation by the Contractor, the Contractor shall seal the abandoned borehole or well in accordance with State of New York requirements for well sealing when directed by the Construction Manager. Every attempt shall be made to remove the well casing. Salvaged material furnished by the Contractor shall remain his property. The Contractor shall install another complete well adjacent to the abandoned well at a location approved by the Construction Manager. Sealing of the well or borehole and installation of the new well or borehole shall be at the Contractor's expense.

- F. Installation of Casing and Screen:

1. Assembly: All casing and screen shall be new, free from contamination, and in good condition before installation. All joints and other accessory parts shall be securely fastened in place. Particular care shall be exercised to avoid damaging the screen, centralizers, and casing during the installation and throughout all subsequent operations. When specified in the Contract Specifications and Contract Drawings, centralizers shall be installed a minimum of every 20 feet of depth with a minimum of two per hole.
2. Joints: All joints shall be flush threaded as provided by the manufacturer.
3. Installation: The assembled screen, centralizers, and casing shall be placed in the well hole in such a manner as to avoid jarring impacts and to ensure that the

assembly is not damaged or misplaced. The screen and casing shall be centered in the well hole and held securely in place during placement of the filter pack, by means of centralizers. Centralizers will not be permitted on the screen. Immediately after the installation of the screen and casing, the depth of the well shall be measured. The casing top elevation shall be determined and recorded, and the well shall be capped after development.

4. Plumbness: Each completed well shall be straight and plumb. Immediately before placing the filter pack and with top of casing fastened securely in a vertical and horizontal position, a visual plumbness survey shall be conducted by the Contractor in the presence of the Construction Manager.
- G. Placement of Filter Pack Material: After the screen and casing have been placed and plumbness surveys are conducted, the filter pack shall be poured around the casing, from the bottom of the borehole up, in such a manner as to ensure uniform placement around the screen. The filter pack shall be placed in one continuous run. The filter pack shall have a minimum thickness of not less than two (2) inches between the outside of the casing and the inside of the borehole.
- H. Bentonite Pellet Seal: Any temporary casing in the hole shall be removed, and a bentonite seal shall be placed around the permanent casing at the depth shown on the Contract Drawings. Bentonite pellets shall be introduced slowly and allowed to settle. Soundings shall be made with a weighted tape to confirm that the pellets and filter pack have not bridged. After the bentonite seal has hydrated for 12 hours minimum, a bentonite cement grout shall be placed from the top of the bentonite seal to the ground surface using tremie method of placement in a continuous manner. The grout mix shall consist of 5 lbs. of bentonite, one (1) sack (94 lbs.) of cement, and eight (8) gallons of water. A precast concrete manhole shall be installed.
- I. Development of Well:
1. Well development shall commence after the grout has cured for at least 24 hours. Development of the well shall commence by bailing, air lifting, pumping or other method which will not cause damage to or collapse of the screen. Development shall continue until the water is visually free of sand and fines. Surging with air or pumping shall continue until discharge has a clear appearance acceptable to the Construction Manager. The method shall be submitted to the Construction Manager for approval.
  2. During development, the wells shall be pumped at rates sufficiently high, as approved by the Construction Manager, to rapidly drop the pumping water level to a point near the pump intake, to induce fines into the well.
  3. Water discharged from the well shall be disposed of in accordance applicable regulations.
- J. Capping Well: At all times prior to well completion and acceptance, the open hole shall be maintained in a manner that will not constitute a hazard to either humans or animals. Sufficient precautions shall be taken to prevent extraneous material or substances from falling into either the bore hole or casing. An 8-inch threaded cap or approved sanitary

seal shall be installed on the casing. All wells shall be locked. Keys for the well cap locks shall be given to the Construction Manager upon well installation completion.

END OF SECTION





**HARPER STREET YARD**  
**FMS ID# HWQF027C**

10/10/10 11:10:10 AM

**RESULTS OF GEOTECHNICAL LABORATORY TESTING**  
**FOUNDATION RECOMMENDATIONS REPORT**

**NO TEXT ON THIS PAGE**

**HARPER STREET YARD  
32-11 HARPER STREET, CORONA  
BOROUGH OF QUEENS, NY**

**RESULTS OF GEOTECHNICAL LABORATORY TESTING**

FMS I.D.: HWQF027C  
TASK NO. 6904  
SES No. 3910



City of New York City  
Department of Design and Construction  
Division of Technical Support  
Bureau of Environmental and Geotechnical Services  
30-30 Thomson Avenue  
Fifth Floor  
Long Island City, New York 11101

Louis Berger & Assoc., PC  
199 Water Street, 23<sup>RD</sup> floor  
New York, NY 10038

Registration No. 20101402206  
Work Order No. 6904-LBA-2R-6658

June 18, 2010

**Results of Geotechnical Laboratory Testing  
Harper Street Yard, 32-11 Harper Street, Corona  
Borough of Queens, NY**

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Unconfined Compression Test .....	GT-5 to GT-6

LBA Proj No. PC890A5 / DDC Proj. No. HWQF027C SES# 3910  
HARPER STREET YARD, 32-11 HARPER STREET, CORONA, QUEENS, NY  
LABORATORY TESTING DATA SUMMARY

BORING NO.	SAMPLE NO.	DEPTH (ft)	SOIL IDENTIFICATION TESTS											
			USCS SYMBOL (1)	SIEVE MINUS No. 200	ATTERBERG LIMITS			NATURAL WATER CONTENT	UCS (2) psi	USS (3) psi	C <sub>c</sub> (4)	C <sub>v</sub> (5)	e <sub>p</sub> (6)	P <sub>c</sub> (7)
					PL	LL	PI							
B-1A	U-1	14-16	OH		68	117	49	117.7	13.19	6.593				
B-1A	S-9	20-22	OH		69	106	37	79.6						
B-1A	U-2	34-36	OH		76	110	34	82.0	6.062	3.031				
B-1A	S-19	42-44	OH		73	108	35	91.3						
B-1A	S-24	55-57	OH		65	109	44	62.4						
B-1A	S-25	60-62	SP	3.4										
B-1A	S-29	80-82	SP	3.1										
B-1A	S-31	90-92	MH		40	69	29	16.7						
B-1A	S-36	115-117	SM	22.8										
B-1A	S-38	125-127	SM	43.6										

Note: (1) USCS symbol based on visual observation and Sieve reported.

(2) Unconfined Compressive Strength

(3) Undrained Shear Strength

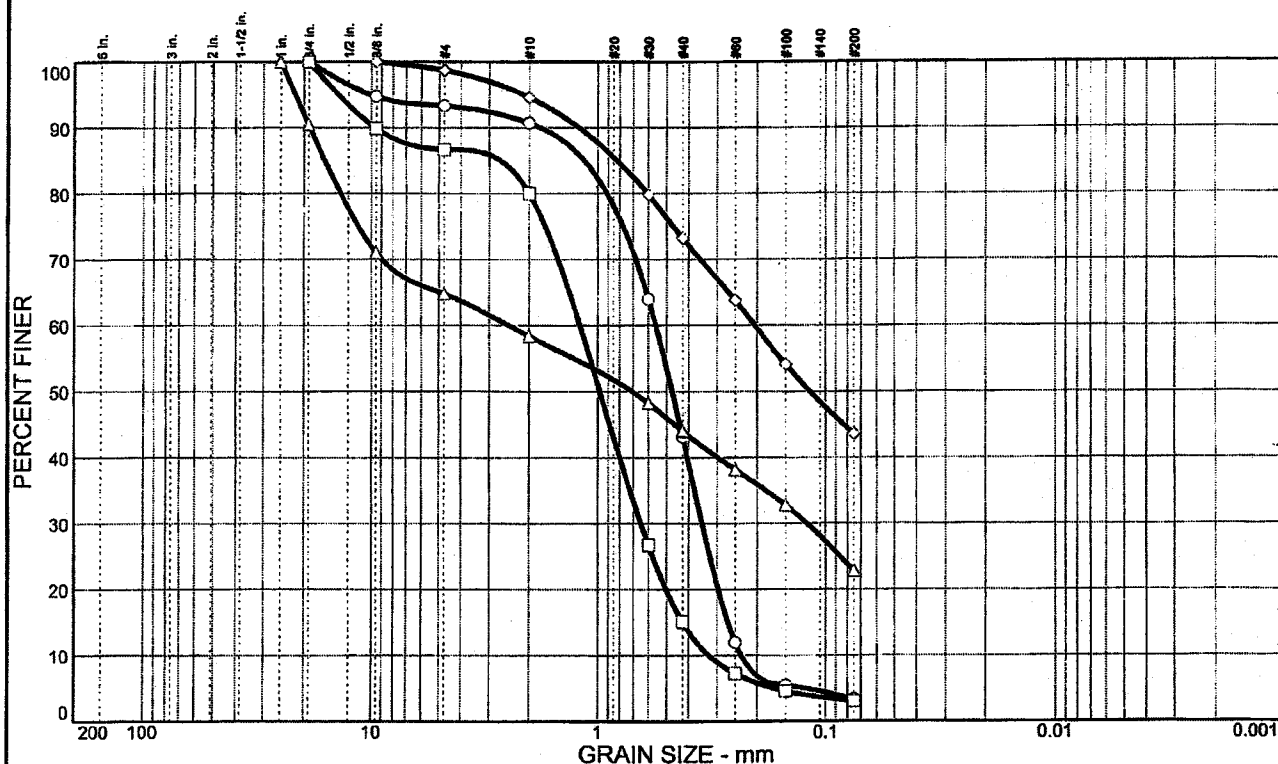
(4) Compression Index

(5) Coefficient of Consolidation (ft<sup>2</sup>/day)

(6) Initial Void Ratio

(7) Preconsolidation Pressure (tsf)

# Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
○ 0.0	6.7	89.9	3.4	
□ 0.0	13.3	83.6	3.1	
△ 0.0	35.2	42.0	22.8	
◇ 0.0	1.3	55.1	43.6	

LL	PL	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
○		1.14	0.557	0.471	0.349	0.269	0.235	0.93	2.37
□		2.67	1.20	0.978	0.648	0.423	0.325	1.08	3.68
△		16.1	2.45	0.703	0.121				
◇		0.821	0.205	0.117					

MATERIAL DESCRIPTION	USCS	AASHTO
○ Gray poorly graded sand	SP	
□ Gray poorly graded sand	SP	
△ Gray silty sand with gravel	SM	
◇ Gray silty sand	SM	

**Project No.** 08-67102-01    **Client:** The Louis Berger Group, Inc  
**Project:** KT890A5  
 ○ **Source:** Harper St Yard,    **Sample No.:** B-1A, S-25    **Elev./Depth:** 60' - 62'  
 □ **Source:** Harper St Yard,    **Sample No.:** B-1A, S-29    **Elev./Depth:** 80' - 82'  
 △ **Source:** Harper St Yard,    **Sample No.:** B-1A, S-36    **Elev./Depth:** 115' - 117'  
 ◇ **Source:** Harper St Yard,    **Sample No.:** B-1A, S-38    **Elev./Depth:** 125' - 127'

**Remarks:**

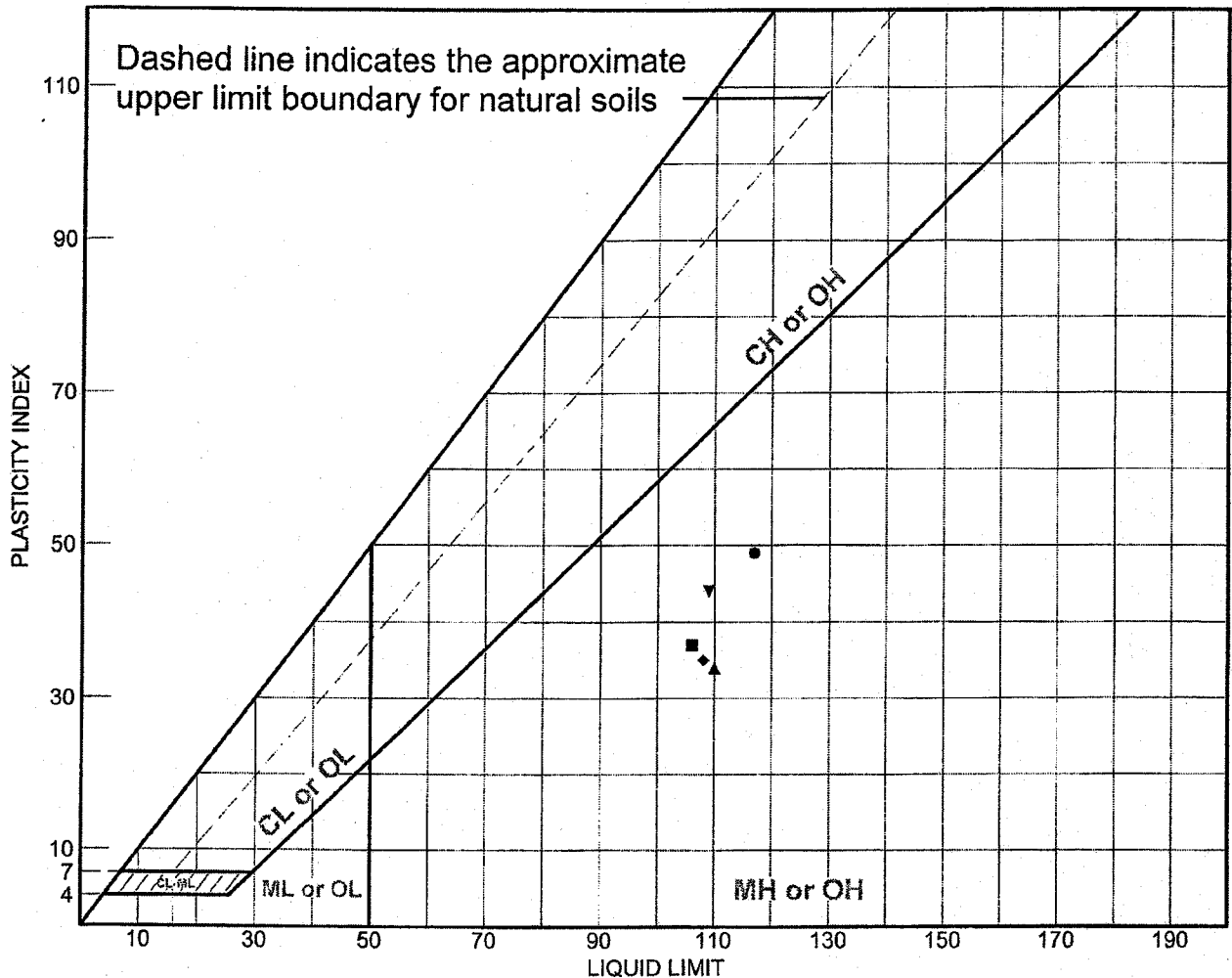
○  
□  
△  
◇



**Converse Consultants**

Figure 6/18/10

# LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	Harper St	B-1A, U-1	14' - 16'	117.7	68	117	49	OH
■	Harper St	B-1A, S-9	20' - 22'	79.6	69	106	37	OH
▲	Harper St	B-1A, U-2	34' - 36'	82.0	76	110	34	OH
◆	Harper St	B-1A, S-19	42' - 44'	91.3	73	108	35	OH
▼	Harper St	B-1A, S-24	55' - 57'	62.4	65	109	44	OH



**Converse Consultants**

**Client:** The Louis Berger Group, Inc

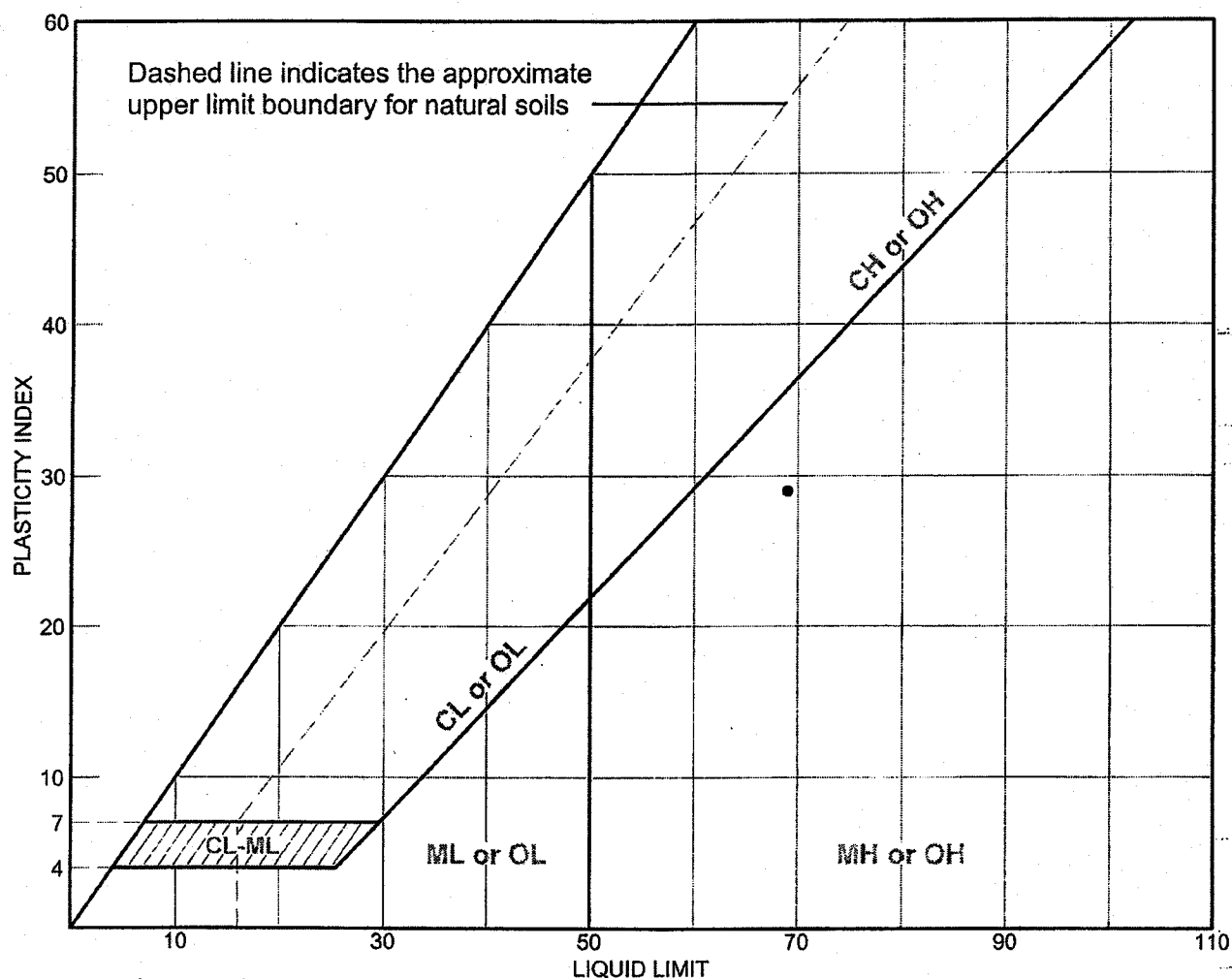
**Project:** KT890A5

Harper St Yard, Corona, Queens, NY

**Project No.:** 08-67102-01

**Figure** 6/18/10

# LIQUID AND PLASTIC LIMITS TEST REPORT



## SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
•	Harper St	B-1A, S-31	90' - 92'	16.7	40	69	29	MH



Converse Consultants

Client: The Louis Berger Group, Inc

Project: KT890A5

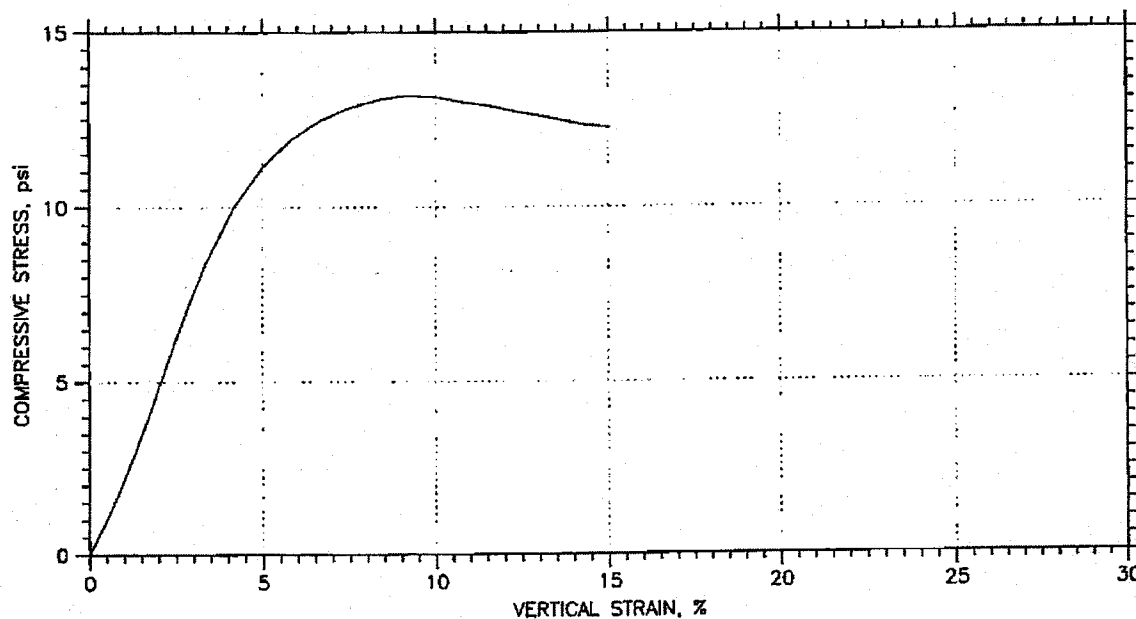
Harper St Yard, Corona, Queens, NY

Project No.: 08-67102-01

Figure



## UNCONFINED COMPRESSION TEST REPORT



Symbol				
Test No.		U-1		
Initial	Diameter, in	2.843		
	Height, in	5.983		
	Water Content, %	140.86		
	Dry Density, pcf	33.6		
	Saturation, %	95.15		
	Void Ratio	3.92		
Unconfined Compressive Strength, psi		13.19		
Undrained Shear Strength, psi		6.593		
Time to Failure, min		8.8042		
Strain Rate, %/min		1		
Estimated Specific Gravity		2.65		
Liquid Limit		117		
Plastic Limit		65		
Plasticity Index		52		
Failure Sketch				



Project: Harper St Yard

Location: Queens, NY

Project No.: 08-67102-01

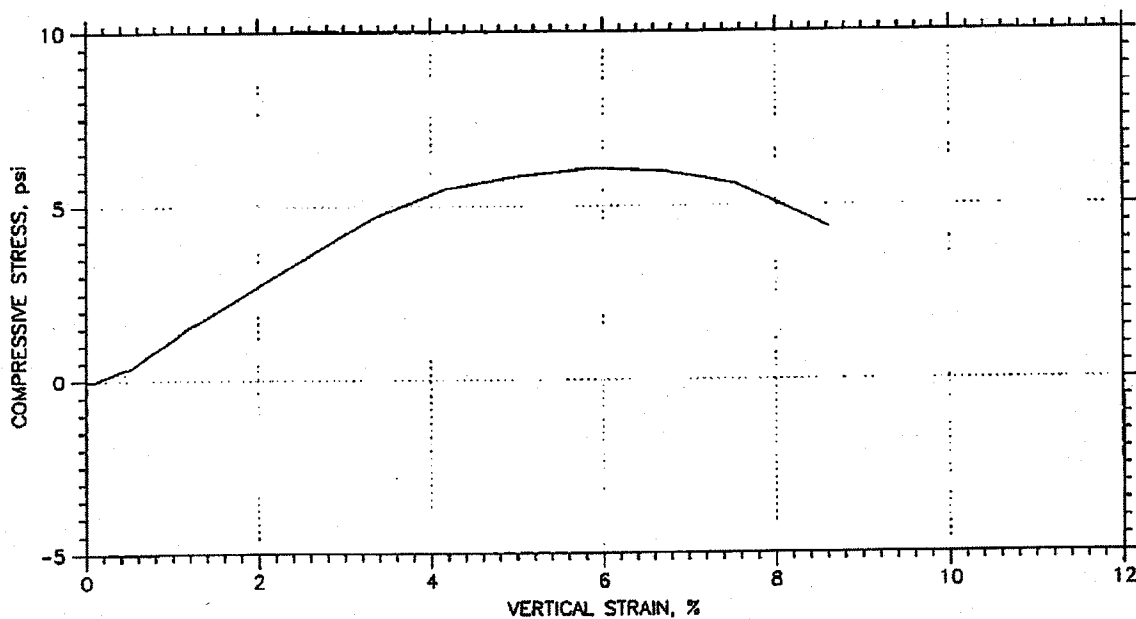
Boring No.: B-1\_U-1

Sample Type: Shelby Tube

Description: Gray organic

Remarks:

## UNCONFINED COMPRESSION TEST REPORT



Symbol				
Test No.	U-2			
Initial	Diameter, in	2.825		
	Height, in	5.968		
	Water Content, %	74.03		
	Dry Density, pcf	55.5		
	Saturation, %	99.03		
	Void Ratio	1.98		
	Unconfined Compressive Strength, psi	6.062		
	Undrained Shear Strength, psi	3.031		
	Time to Failure, min	5.6572		
	Strain Rate, %/min	1		
	Estimated Specific Gravity	2.65		
	Liquid Limit	110		
	Plastic Limit	76		
	Plasticity Index	34		
Failure Sketch				



Project: Harper St Yard

Location: Queens, NY

Project No.: 08-67102-01

Boring No.: B-1A\_U-2

Sample Type: Shelby Tube

Description: Gray organic clay

Remarks:

The sliding Lugin shown on this sheet are the result of inferences drawn by the engineers or scientists observing driving testing operations at the site, and from certain visual evidence such as: (1) samples of behavioral deviations encountered during driving operations; (2) the top logs kept by the shift operators and the inspection which contain, among other things, impression of their opinions as to the values of subjective variables associated during driving operations; and (3) other records concerning the data obtained particularly by the engineers. Of this log, the Inspector's top, the samples and the records, together with the engineer's reports, are made available for inspection and study by the addressee so that they may draw their own inferences from all of the available evidence.

Bidders are warned that in the submittal, after they had actually perused by the drawings, construction, both verbal and material, and which are not indicated on the Bidding List, may be encountered, but the Bidding List make no representations or warranties either as to the presence or absence of such conditions, or as to the nature and extent. Where possible, bidders are looked to avoid all obstructions and preclude construction which can be fairly inspected of the surface, and the bidder is required to estimate the quantity of such materials from their own inspection of the site.

In addition, bidders are warned that the submittal drawings shall not be taken as the basis for construction. It is further stated that the submittal drawings shall not be taken as the basis for construction.

The "water reading" shows the elevation of water in the boating holes at the times indicated. They may or may not indicate the elevations of boated water or true ground water table during boating.

Overseer's Term	Pass Slave No.	Soil Sizes	Refracted Slave No.	Star Range
1851	200	Attaining Line,	200	< 200 mm.
1852	200	Hydraulic Ampull	200	200 to 470 mm.
1853	40		40	370 to 470 mm.
1854	19		19	200 to 250 mm.
1855	4		4	470 to 520 mm.
1856	(table 1)			470 mm. to 7
1857	200		200	5 to 6
1858	200		200	5 to 6

[illegible][illegible][illegible]

**SPOON SAMPLES**

Unless otherwise specified, sample spoons were taken 24 inches in = Number of fillers required to drive sample spoon for each ft

Percentage of material with values between values 500

36 1.2 2 15 15

[illegible][illegible]

<p>established by the U.S. Coast &amp; Geodetic Survey.</p>	<p>GRIZ, JON LACANALE, JOHN SOIL AND ROCK ANALYSIS BY</p>
<p>ESIN, DINCER PhD, PE ASSTNG GEOTECHNICAL ENGINEER LOS ANGELES &amp; ASSOC. INC.</p>	

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LOCATION PI AN

LABORATORY ANALYSIS OF SOILS AND ROCK \*  
 SAND

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SPECIMENS	SAMPLES	DEPTH, m	LOCAL NAME	PARTICLE SIZE	PARAMETERS		SLIT AND CLAY		PLASTICITY INDEX, $I_p$	SHRINKAGE RATIO, $S_r$	LIQUID LIMIT, $w_L$ , %	PL
					SHRINKAGE CONSTANT, $K_s$	CLAY CONTENT, $C_c$ , %	SHRINKAGE RATIO, $S_r$	PLASTICITY INDEX, $I_p$				
1	12	0.08	37	65	—	13.13	1.0	0.58	—	—	—	—
2	13	0.10	39	65	—	—	—	—	—	—	—	—
3	14	0.12	39	65	—	—	—	—	—	—	—	—
4	15	0.14	39	65	—	—	—	—	—	—	—	—
5	16	0.16	39	65	—	—	—	—	—	—	—	—
6	17	0.18	39	65	—	—	—	—	—	—	—	—
7	18	0.20	39	65	—	—	—	—	—	—	—	—
8	19	0.22	39	65	—	—	—	—	—	—	—	—
9	20	0.24	39	65	—	—	—	—	—	—	—	—
10	21	0.26	39	65	—	—	—	—	—	—	—	—
11	22	0.28	39	65	—	—	—	—	—	—	—	—
12	23	0.30	39	65	—	—	—	—	—	—	—	—
13	24	0.32	39	65	—	—	—	—	—	—	—	—
14	25	0.34	39	65	—	—	—	—	—	—	—	—
15	26	0.36	39	65	—	—	—	—	—	—	—	—
16	27	0.38	39	65	—	—	—	—	—	—	—	—
17	28	0.40	39	65	—	—	—	—	—	—	—	—
18	29	0.42	39	65	—	—	—	—	—	—	—	—
19	30	0.44	39	65	—	—	—	—	—	—	—	—
20	31	0.46	39	65	—	—	—	—	—	—	—	—
21	32	0.48	39	65	—	—	—	—	—	—	—	—
22	33	0.50	39	65	—	—	—	—	—	—	—	—
23	34	0.52	39	65	—	—	—	—	—	—	—	—
24	35	0.54	39	65	—	—	—	—	—	—	—	—
25	36	0.56	39	65	—	—	—	—	—	—	—	—
26	37	0.58	39	65	—	—	—	—	—	—	—	—
27	38	0.60	39	65	—	—	—	—	—	—	—	—
28	39	0.62	39	65	—	—	—	—	—	—	—	—
29	40	0.64	39	65	—	—	—	—	—	—	—	—
30	41	0.66	39	65	—	—	—	—	—	—	—	—
31	42	0.68	39	65	—	—	—	—	—	—	—	—
32	43	0.70	39	65	—	—	—	—	—	—	—	—
33	44	0.72	39	65	—	—	—	—	—	—	—	—
34	45	0.74	39	65	—	—	—	—	—	—	—	—
35	46	0.76	39	65	—	—	—	—	—	—	—	—
36	47	0.78	39	65	—	—	—	—	—	—	—	—
37	48	0.80	39	65	—	—						

SA	24	55-57	62-6	110	65	44	-
SA	31	58-62	117	68	49	38	-

**LEGEND**

- TEST ROOMING
- TEST ROOMING (FALLBACK/TESTCRAFT)
- ⊙ AND/OR IN FLIGHT TEST ROOMING
- ⊕ AND/OR ON GROUND TEST ROOMING
- ▲ TEST ROOMING WITH

☐ PAYMENT CODE

☒ TEST SIZING AND PAYMENT CODE  
(at same location)

☒ SERVICE

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**CITY OF NEW YORK**  
DEPARTMENT OF DESIGN & CONSTRUCTION

3910	PROJECT NAME:	HARPER STREET YARD N-44 HARPER STREET, ARBON
	PREPARED BY:	BUREAU OF ENVIRONMENTAL AND GEOTECHNICAL SERVICES
	CONSULTANT NAME:	LOUIS BERGER AND ASSOC. P.C. 100 WATER STREET, 2ND FLOOR NEW YORK, NY 10038

31-411 HAWKER STREET, CARROLL  
BOROUGH OF QUEENS  
RECORD OF BORINGS

DATE: JUNE 16, 2010	
PROJECT NO: HW0000770	
DRAWING OF: BRICKA, ELUS	
CHECK: REX ANDREW	
QMS INC	B-101.00

CARD FILE NO: 3016-R008-01	SHEET 1 OF 1
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**NO TEXT ON THIS PAGE**

**-Draft-**  
**Foundation Recommendations Report**  
**For**  
**Harper Street Yard – Floor Leveling**  
**32-11 Harper Street, Corona**  
**Queens, New York**

DDC PROJECT NO. HWQF027C / SES 3910  
WORK ORDER NO. 6904-LBA-2R-6658  
CONTRACT REGISTRATION NO. 20101402206

Prepared for:



Bureau of Environmental and Geotechnical Services  
30-30 Thomson Avenue, Fifth Floor  
Long Island City, New York 11101

Prepared by:



Louis Berger & Assoc., PC  
199 Water Street, 23<sup>rd</sup> Floor  
New York, NY 10038  
Tel. (212) 612-7900 Fax (212) 363-4341  
PROJECT NO. PC890A5

July 2010



## SEALS PAGE

**Name:** Foundation Recommendations Report  
Harper Street Yard – Floor Leveling  
**Location:** 32-11 Harper Street, Corona, Queens, NY  
**Dated:** July 22, 2010  
**Prepared For:** New York City Department of Design and Construction  
**Prepared by:** Louis Berger and Assoc., P.C.

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Geotechnical Engineer  
NJ PE License Number: 24GE04631800



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Appendix C Boring and Test Pit Logs  
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## EXECUTIVE SUMMARY

The New York City Department of Design and Construction (DDC) has requested Louis Berger and Assoc., P.C. (Berger) to perform boring and test pit inspections, geotechnical evaluations and engineering services for the proposed floor rehabilitations to the existing Harper Street Yard New York City Department of Transportation (NYCDOT) truck garage located at 32-11 Harper Street, Corona, Queens, New York (hereinafter “Site”). The Harper Street Yard NYCDOT truck garage (the “garage”) was constructed in 1929. The garage supports maintenance operations for the fleet of NYCDOT trucks and other support vehicles. The floor of the garage consists of a concrete slab at grade supported by grade beams. The grade beams are supported by piles. Piles are advanced to unknown depths.

The existing concrete floor slab in the garage is experiencing settling. The settlement of the slab is based on visual evidence and elevation shifts that are present at joints. The elevation shifts tend to be two to four inches in difference. The purpose of this investigation was to explore and evaluate the subsurface conditions underlying and in the vicinity of the garage and provide geotechnical engineering assessment leading to preliminary recommendations and alternatives for the rehabilitation of the currently settling slab.

Robert Silman Associates (Silman) is the design consultant responsible for providing design plans for the foundation rehabilitation. This Foundation Recommendations Report is prepared based on information received from the results of the field investigation and in response to Silman’s memorandums dated January 26, 2010 and April 22, 2010. The objective of this report is to address Options A1, A2 and B as presented in Silman’s April 22, 2010 memorandum and provide additional observations or recommendations, if appropriate.

Berger provided oversight for the drilling of three (3) geotechnical borings inside the garage and excavation of six (6) test pits to investigate the foundation of the garage. In addition, one (1) geotechnical boring (associated with the construction of a proposed 7,000 gallon underground storage tank) was advanced approximately 213’ north of the garage.

Subsurface conditions below the garage slab were summarized from the completed boreholes and test pits. Based on the information collected, there are three (3) strata underlying the 0 to 3 inch thick asphalt pavement and 6 to 12 inch thick concrete slab. These strata are (from top to bottom):

- Stratum 1- an approximately 10-foot thick, generally medium to dense fill stratum; underlain by
- Stratum 2- an approximately 40-foot thick soft to medium organic / non-organic silt or clay (at B-1 the silt/clay layer was 70-foot thick which included a 10 foot thick sand layer interbedded within the silt/clay layer); underlain by
- Stratum 3- dense to very dense sand.



Based on conversations with garage personnel and observations made during the advancement of test pits, a concrete grout was injected below the slab at various depths and locations in an effort to stabilize settling. Limited information is available as to technique, volume or specific locations utilized for injections.

Groundwater was observed to be approximately 5 to 6 feet below the existing grade.

An engineering evaluation was performed subsequent to field investigations to assess the feasibility of different slab rehabilitation alternatives and to make recommendations based on the available data. At the time of the preparation of this report, only the slab rehabilitation options proposed by Silman were assessed. The loads and reactions were not available for review. Therefore, after finalization of the site development plans and the rehabilitation load schedule and loads, additional engineering analysis may be required to verify the suitability of the recommended foundation system.

Based on the geotechnical investigation and subsequent engineering assessment (detailed in the body of the report), the following conclusions and recommendations are provided:

1. Minor cracking in the exterior façade of the garage and settlement of the existing concrete slab indicate structural issues for the building foundation.
2. This report is based on the field borehole and test pit data, laboratory test results and general information for the proposed development. Subsurface conditions at the site consist of (from top to bottom):

Stratum 1-	an approximately 10-foot thick, generally medium to dense fill stratum;
Stratum 2-	an approximately 40 to 70-foot thick soft to medium organic / non-organic silt or clay), underlain by
Stratum 3-	dense to very dense sand

Groundwater was observed between 5 to 6 feet below the existing grade.

3. Settlement is most likely to occur within Stratum 2. The total settlement cannot be estimated without knowing the structure loads and the pile construction details.
4. The three alternatives being considered by DDC, based on Robert Silman Associates' memo dated January 26, 2010 authored by Nat Oppenheimer and additional conversation with Errol Silva (DDC Structures Unit), are:
  - a. Option A1 Pour new reinforced concrete slab over the existing settling slab.
  - b. Option A2 Remove existing slab, compact subbase, and place new slab
  - c. Option B New load bearing piles and slab ties into new piles

5. Response to Option A1: The existing slab does not have any significant cracks and observations indicated that the slab was in good condition. This indicates the existing reinforced slab is strong enough to carry the settlement without cracking. The concern at the Site is settlement of the whole slab (estimated 2 to 3 inches). Option A1 would create a new smooth surface on top of the slab which would correct cracking; however, Option A1 will not address settlement which is the primary concern at the Site.
6. Response to Option A2: This Option is similar to Option A1 in that it would repair any damage within the building slab, but not address the underlying issue of settlement unless the subgrade were to be overexcavated and replaced with lightweight fill, which may reduce the loads and therefore settlement in Stratum 2. If the top ~6 feet was to be excavated and replaced with ~5 feet of light fill and one foot of slab, the stress on Stratum 2 could be reduced; however, without the building loads and pile construction details it is difficult to evaluate the effectiveness of this in reducing settlement.

If the entire floor slab were to be replaced, it is recommended that it be saw cut to minimize vibrations which may cause damage to the utility pipes, windows or other sensitive structures. The use of a jack-hammer (small, one-man operated) should only be allowed after recording and observing the level of vibrations, in terms of peak particle velocity, to be limited to below 0.10 in/s at frequencies greater than 40 Hertz at the column or load-bearing wall locations closest to the jack-hammer work area. Naturally, during saw cutting or breaking the slab with a jack-hammer, measures to mitigate the dust and noise impacts will be taken. Additionally, care should be taken to avoid damage to utilities.

After removal of the existing floor slab, in order to provide a satisfactory subgrade, the following site preparation would be required:

- Cut two feet below the bottom of the existing slab. If available, recycle the concrete slab pieces by producing  $\frac{3}{4}$ -inch sized stone for future use (see below). If this is not possible, or cost-effective, dispose of the removed slab pieces as well as excavated soils.
- Compact the exposed surface (at two feet below) to 95% of the maximum dry density (of the Stratum 1 fill, sand), as determined in ASTM D 1557. During compaction, ensure that vibrations remain below 0.10 in/s at the nearest column or load-bearing wall locations to avoid damage to the existing facilities, or the foundations.
- Place four feet of lightweight aggregate with a maximum unit weight of 70 pcf in six (6)-inch thick lifts. Compact each lift to 95% of the maximum dry density of the lightweight aggregate as determined in ASTM D 1557. During compaction, ensure that vibrations remain below 0.10 in/s to avoid damage to the existing facilities or the foundations. Bring the fill to 6 inches below the bottom elevation of the floor slab.



- Place a six (6)-inch thick layer of ¾-inch size crushed stone for under-slab drainage (use recycled slab concrete, if recovered). Compact crushed stone in six overlapping passes using a compactor with a foot pressure of about 100 psi. Ensure that excessive vibrations are not generated to cause damage to the existing structures and facilities.
- Place a vapor barrier and construct the slab as designed by others.
- Unless recommended otherwise by the project structural engineer, place a 12-inch thick, reinforced concrete slab. .

Due to use of the lightweight fill, the stress imposed on the subgrade will be reduced, potentially reducing future settlement.

Option A2 may be viable pending further design analysis.

7. Response to Option B: The settlement is likely occurring within Stratum 2. Transferring the loads to suitable soils below Stratum 2, via new piles, would eliminate settlement. However, driving piles would likely not be viable due to overhead clearance and vibration concerns.

Of the potentially available pile types (H-piles, pipe piles and mono-tube piles, and drilled piles, including continuous flight auger piles (CFA-piles), micropiles and a helical micropile foundation system (e.g., screw-type Chance piles)), micropiles are considered to be the most suitable foundation support for this project.

Micropiles consist of a continuous threaded, hollow reinforcing tendon as the load-carrying steel member, together with a grout body of portland cement with 5,000 psi strength, which allows the transfer of tension and compression forces—mainly from the friction of the threaded tendon via the grout body—into the bearing stratum of sand of both the fill (Stratum 1) and the underlying silty sand (Stratum 3), below the clay/silt layers. Generally, the micropiles are installed using a standard rotary or rotary percussive drill rig in a one-visit drilling operation. The installation procedure uses a grout flush to stabilize the annulus, consequently eliminating the use of casings. The installation of the micropiles is also almost free from vibration and has a low noise level. In addition, micropiles require smaller holes and work with small rigs, which results in less drill spoil and relatively lower mobilization costs. During the installation of the micropiles, grout should be selected with a water-to-cement ratio of 0.4, and the grout should be pumped using a minimum pressure of 300 psi. Based on the subsurface conditions, piles would have to extend a minimum of up to 80 ftbg into Stratum 3 to reach suitable bearing material.

For higher pile capacity requirements, longer micropiles may be required.

8. There are other possible alternatives which may be evaluated. For example, an option which can be considered is an arc floating slab by constructing a lower slab about 5 ftbg

and leave void construct the upper slab as part of the floor support.

9. Based on the soil resistivity and soil chemical test results, the concentrations of sulfate in the soil indicate a “negligible to mild” potential for sulfate attack on concrete. Therefore, dense concrete with a maximum water/cement ratio of 0.45 of Type I or Type II Portland cement in contact with soil can be used in all foundation concrete and concrete in contact with soil and water. Buried concrete should be dense and fully compacted, and the minimum cement content requirement of ACI should be observed. Similarly, chloride contents indicate a “negligible” to “mild” potential of corrosion to uncoated, ferrous metals (such as reinforcing bars, steel pipes or other steel members of the structure in contact with the soil). A minimal cover for reinforcement steel in accordance with ACI requirements should be provided. Pipes in contact with soil should also be protected in accordance with the manufacturer’s recommendations.
10. It is recommended that the subgrade preparation for the new floor slab and the micropile design and installation should be made under the supervision of a New York Registered Professional Engineer.



## 1.0 INTRODUCTION

### 1.1 Project Description

The New York City Department of Design and Construction (DDC) has requested Louis Berger and Assoc., P.C. (Berger) to perform boring and test pit inspections, geotechnical evaluations and engineering services for the proposed floor rehabilitations to the existing Harper Street Yard New York City Department of Transportation (NYCDOT) truck garage located at 32-11 Harper Street, Corona, Queens, New York (hereinafter “Site”). See **Figure 1 - Site Location Map**.

The Harper Street Yard NYCDOT truck garage (the “garage”) was constructed in 1929. The garage supports maintenance operations for the fleet of NYCDOT trucks and other support vehicles. The floor of the garage consists of a concrete slab at grade supported by grade beams as shown on **Figure 2 - Boring and Test Pit Location Plan**. The grade beams are supported by piles. Piles are advanced to unknown depths.

### 1.2 Goals and Objectives

The existing concrete floor slab in the garage is experiencing settling. The settlement of the slab is based on visual evidence and elevation shifts that are present at joints. The elevation shifts tend to be two to four inches in difference. The purpose of this investigation was to explore and evaluate the subsurface conditions underlying and in the vicinity of the garage and provide geotechnical engineering assessment leading to preliminary recommendations and alternatives for the rehabilitation of the currently settling slab.

Robert Silman Associates (Silman) is the design consultant responsible for providing design plans for the foundation rehabilitation. This Foundation Recommendations Report is prepared based on information received from the results of the field investigation and in response to Silman’s memorandums dated January 26, 2010 and April 22, 2010. See **Appendix A - Robert Silman Associates’ Memorandums**. The objective of this report is to address Options A1, A2 and B as presented in Silman’s April 22, 2010 memorandum and provide additional observations or recommendations, if appropriate.

## 2.0 DATA COLLECTION

### 2.1 Site Reconnaissance

Berger visited the site on May 4, 2010 with representatives of NYCDDC to observe and identify the surface conditions and general geologic and topographic setting, surface soils and related conditions. See **Appendix B** - Project Photographs. The existing NYCDOT truck garage is located about 275 feet south of Flushing Bay, and is situated directly to the east of Harper Street, to the north of Northern Boulevard, and to the west of the elevated Whitestone Expressway in Corona, Queens, New York. See **Figure 1** - Site Location Map.

Based on visual evidence, the slab is settling and elevation shifts are present at joints. The elevation shifts tend to be two to four inches in difference.

### 2.2 Physical Setting

#### 2.2.1 Topography

Based on a review of the United States Geological Survey (USGS) 7.5-Minute quadrangle for Flushing, New York, the Site is generally flat, with an average surface elevation of less than 10 feet above mean sea level. Site topography generally slopes to the north-northwest, towards Flushing Creek.

#### 2.2.2 Geology

The *NYC Reconnaissance Soil Survey (2005)* indicates the Laguardia-Ebbets complex underlies the Site. This complex is classified as a nearly level to gently sloping area filled with a mixture of natural soils and construction debris over swamp, tidal marsh, or water. Some anthropogenic soils may be encountered and up to 49 percent of the land surface is covered by impervious pavement or buildings. Boring logs provided by the NYCDDC indicate that fill is underlain by Upper Pleistocene glacial outwash deposits.

*The Subsurface Geology and Paleogeography of Queens County, Long Island New York (1978)* indicates the surficial deposits and Pleistocene glacial deposits are underlain by the Clay Member of the Raritan Formation. The Clay Member of the Raritan Formation is composed of clay beds with inclusions of silty clay and clayey silts containing fine quartz sand, lignite and pyrite occur sporadically. Underlying the Clay Member of the Raritan Formation is the Lloyd Sand Member, which consists of fine to coarse quartz sand interbedded with silt and gravel layers.

According to the *Bedrock and Engineering Geologic Maps of Bronx and Parts of New York and Queens County New York (1992)*, the Clay Member and the Lloyd Sand Member of the Raritan Formation are underlain by the Pelham Bay Member of the Hartland Formation. The Pelham Bay Member consists of sillimanite-grade gneiss and garnet-plagioclase-sillimanite-muscovite

and quartz gneiss. Bedrock is expected to be encountered at approximately 200 feet below ground surface (bgs) at the Site.

A twelve (12)-inch thick layer of reinforced concrete and/or asphalt pavement was encountered throughout the Site. Observations during borings completed for the investigation, a layer of fill was encountered in all borings below to a depth of approximately nine (9) to eleven (11) feet below grade (ftbg). Fill generally consisted of medium light to dark gray-brown sand mixed of coarse and fine sand with some to trace silt, and some to trace gravel with fragments of construction and demolition material mixed in.

### 2.2.3 Hydrology

The nearest surface water body to the Site is Flushing Creek, which borders the northern portion of the Site. Flushing Creek flows northwest before discharging into Flushing Bay immediately west of the Site. During the investigation, the groundwater table was encountered within the fill material between 5.0 and 6.0 ftbg. Under natural conditions, groundwater would be expected to mimic local topography and flow northeast discharging directly into Flushing Creek. However, groundwater flow directions may vary due to tidal influence, seasonal surface water, fluctuations in precipitation, local usage demands, underground utilities, or dewatering operations.

Wetlands are defined according to hydrophytic vegetation, hydric soils, hydrology, and other characteristics. According to the National Wetland Inventory, the nearest mapped wetlands are estuarine and marine wetlands, located approximately 1,300 feet southeast of the Site, along the bank of Flushing Creek.

Based on the Environmental Database Report (EDR, 2009), the Site is not located within the 100-year or 500-year flood plains. A copy of the flood plain map was not available for inclusion in this report.

## 2.3 Investigation Methodology

Berger provided oversight for the drilling of three (3) geotechnical borings inside the garage and excavation of six (6) test pits to investigate the foundation of the garage. In addition, one (1) geotechnical boring (associated with the construction of a proposed 7,000 gallon underground storage tank) was advanced approximately 213' north of the garage. The boring and test pit locations were selected based on accessibility, limits of the proposed rehabilitation work and general site coverage. See **Figure 2 - Boring and Test Pit Location Plan**.

The three (3) geotechnical borings advanced inside the garage, namely B-1, B-2, and B-3, were drilled to depths of 90, 80, and 75 ftbg, respectively. Geotechnical boring B1-A was advanced to a depth of 130 ftbg. The six (6) test pits, namely TP-1 through TP-6, were excavated to a depth of 4 ftbg. Four of the test pits, TP-1, TP-3, TP-4, and TP-5, were excavated inside the garage adjacent to the slab grade beams to assess the condition of the grade beams. Two test pits, TP-2 and TP-6, were excavated outside the garage adjacent to the building footings to assess the





condition of the foundation walls. See **Appendix C** - Boring and Test Pit Logs.

## **2.4 Subsurface Investigation**

Boring B-1A was drilled between May 14 and May 19, 2010. Borings B-1, B-2 and B-3 and test pits TP-1 to TP-6 were advanced between May 27 and June 15, 2010.

### **2.4.1 Borings**

A D50 track drill rig was used to drill borings. Borings were advanced by using the Rotary Mud drilling method with a 3.5-inch diameter cutter bit. Both bulk and representative disturbed soil samples were collected from all borings and test pits. Representative samples from the borings were collected using a 1.4-inch inner diameter (I.D.) split-spoon Standard Penetration Test (SPT) sampler driven with a 140-pound automatic hammer with a 30-inch drop. At all boring locations, disturbed SPT soil samples were collected at every two (2) feet to a depth of 47-50 feet, and at five (5)-foot intervals thereafter, for examination and laboratory testing. The Standard Penetration Tests were conducted in accordance with ASTM D1586 to collect representative samples and estimate the SPT resistance “N” values.

In addition, at B-1A, two undisturbed samples of the compressible (clay) layers (from 14 to 16 and from 34 to 36 ftbg) were obtained by means of 30 inch length Shelby Tube Sampler for strength and compressibility testing.

The field investigation activities were conducted under the observation of a Berger geotechnical engineer. Soil samples were visually classified in the field using the Unified Soil Classification System (USCS). Soil samples were further classified using the Burmister Soil Classification Systems and the New York City Building Code. Representative soil samples were collected for subsequent examination and laboratory testing. The borings and the test pits were backfilled with drill cuttings and bentonite chips, tamped, and the surface was restored to its original condition.

Groundwater levels were observed both by the wetness of the soil sample and through gauging methods. Upon completion of drilling of boreholes, groundwater monitoring wells were installed in B-1, B-2, and B-3. After a stabilization period of 24 hours, three groundwater readings at each monitoring well location were recorded. Groundwater levels were observed at an approximate depth of 5-6 ftbg. Groundwater observations were recorded on boring logs included in **Appendix C**.

### **2.4.2 Test Pits**

Six (6) test pits, TP-1 through TP-6, were excavated at the site to a depth of 4 ftbg to investigate the conditions of the slab, grade beams, piles, and footings.

Test pits were excavated by using a jackhammer to advance through concrete slab as well as any other subsurface concrete and asphalt layers encountered within test pits, saw cutting was



performed to cut through rebars within slab, and manual shoveling was utilized to excavate soils to 4 foot depth. After test pit holes were opened, photos were taken (**Appendix B**) and the test pits subsurface observations were logged (**Appendix C**).

## 2.5 Laboratory Testing

Soil samples collected from test borings were sent to Converse Consultant (Berger's subcontracted geotechnical laboratory) to determine their index characteristics. The following laboratory tests were conducted:

- Grain size distribution in accordance with ASTM D421, D422
- Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils, ASTM D4318
- Quick Test – Load Increment (Consolidation) in accordance with ASTM D2435
- Unconfined Compression (Stress / Strain) in accordance with ASTM D2166.
- pH of Soil Samples in accordance with ASTM D2976
- Moisture Content Determination in accordance with ASTM D2216
- Organic Content Determination in accordance with ASTM D2974
- Soil Resistivity in accordance with ASTM G57
- Soluble Sulfate Determination in accordance with ASTM D516
- Soluble Chloride Determination in accordance with ASTM D512

See **Appendix D** - Laboratory Test Results.

## 3.0 FINDINGS

### 3.1 Existing Surface Conditions

The area surrounding the garage is generally flat and paved. Inside the garage building, there is a 6 to 12- inch thick concrete floor slab overlain by 2 to 3- inch asphalt pavement (based on observation of test pit investigations).

### 3.2 Subsurface Conditions

Subsurface conditions below the garage slab were summarized from the completed boreholes and test pits. Based on the information collected, there are three (3) strata underlying the 0 to 3 inch thick asphalt pavement and 6 to 12 inch thick concrete slab. These strata are (from top to bottom):

- Stratum 1- an approximately 10-foot thick, generally medium to dense fill stratum; underlain by
- Stratum 2- an approximately 40-foot thick soft to medium organic / non-organic silt or clay (at B-1 the silt/clay layer was 70-foot thick which included a 10 foot thick sand layer interbedded within the silt/clay layer); underlain by
- Stratum 3- dense to very dense sand.

A summary of the subsurface conditions, including a brief description of the earth materials and geologic units identified in the record of borings, is presented below.

**Stratum 1** **Fill:** A layer of fill was encountered in all recorded borings below a twelve (12)-inch thick layer of concrete and pavement below the ground surface (bgs) to a depth of about 9 to 11 feet below the existing grade. Fill generally consisted of medium light to dark gray-brown sand mixed of coarse and fine sand with some to trace silt, and some to trace gravel with fragments of construction and demolition material mixed in (such as brick and glass). The SPT resistance “N” values (ASTM Standard D1586) in the fill ranged from 21 to +100 blows/foot, indicating its medium to very dense nature. Two soil samples from within the fill layers were tested for Soil Resistivity, Soil Sulfate and Soil Chloride contents. Soil resistivity tests indicated minimum resistivity values of 2,200 and 5,800 ohm-cm on the two soil samples. Soil sulfate contents were 98 and 330 ppm. Soil chloride contents were 53 and 165 ppm. This generally indicates a low potential for a sulfate attack on concrete and a mild potential for corrosion.

**Stratum 2** **Organic/Non-Organic Clay (CH), (CL-ML), 4b, 4c, 6; Organic/Non-Organic Silt (MH) 6:** A layer organic peat and non-organic clay and silt was identified in all boreholes, at depths from 9 to 11 feet (top) to 47 to 79 feet (bottom).

At B-1, the upper 8 feet of this stratum consisted of loose dark gray clayey silt (MH) 6, the middle 30 feet of this stratum consisted of medium to soft dark gray clay (CH) 4c, 6, and the bottom 20 feet of this stratum consisted of stiff to soft dark gray silty clay (CL-ML) 4b, 4c, 6.

At B-2, the upper 8 feet of this stratum consisted of dark gray silty clay mixed with foreign materials (pieces of glass) and was therefore considered fill material. The bottom 20 feet of this stratum at B-2 consisted of medium to soft dark gray clay (CH) 4c, 6.

At B-3, this stratum is 43 feet thick and it consists of loose dark gray clayey silt (OH), (MH) 6.

The laboratory tests indicated a water content (wc) range of 23.3 to 187.5 percent, a Liquid Limit (LL) range of 26 to 290, a Plastic Limit (PL) range of 19 to 62 and a Plasticity Index (PI) range of 5 to 231. Organic content ranged from 1.7 to 24.7 percent. Generally, the SPT resistance “N” values in organic and non-organic clays and silts ranged from P (pushed under the weight of the rods) to nine (9) blows/foot, indicating that the stratum is very soft to stiff.

**Stratum 3 Sand (SM, SP~SM):** This stratum was observed below the clay / silt stratum at a depth ranging from 47 to 79 ftb. The sand consisted of dark gray coarse to fine sand, little to trace silt and some to trace gravel (SP) (SM), 3a, 3b. Laboratory tests indicated sand content of 55.1 to 96.6 percent, fines content of 3.3 to 18.9 percent, and gravel content of 0.1 to 28.0 percent. The SPT resistance “N” values in the sandy silt ranged from 18 blows/foot to 120 blows/foot, indicating the generally dense to very dense compactness.

Based on conversations with garage personnel and observations made during the advancement of test pits, a concrete grout was injected below the slab at various depths and locations in an effort to stabilize settling. Limited information is available as to technique, volume or specific locations utilized for injections.

### 3.3 Groundwater

Following borehole drilling operations, monitoring wells were installed at borings B-1, B-2, B-3. After a stabilization period of 24 hours, three groundwater readings were obtained at each monitoring well location subsequent to installation. Groundwater was observed to be approximately 5 to 6 feet below the existing grade. The groundwater table is expected to fluctuate depending on climatic factors, surface drainage conditions, tidal influences and other factors. Groundwater readings are shown on the boring logs in **Appendix C**.

## **4.0 ENGINEERING EVALUATION**

An engineering evaluation was performed subsequent to field investigations to assess the feasibility of different slab rehabilitation alternatives and to make recommendations based on the available data.

At the time of the preparation of this report, only the slab rehabilitation options proposed by Robert Silman are assessed. The loads and reactions were not available for review. Therefore, after finalization of the site development plans and the rehabilitation load schedule and loads, additional engineering analysis may be required to verify the suitability of the recommended foundation system.

### **4.1. Existing Foundation Conditions**

Based on Berger's observations at test pit locations (TP-1 through TP-6), the existing floor slab was reinforced and varied in thickness from 6 to 12 inches. The structural slab was supported by grade beams which were constructed in "H" patterns as shown on Figure 2. The slab was overlain by asphalt pavement that measured up to 3 inches thick in certain areas throughout the garage.

The existing sub grade below the floor slab consists of coarse to fine sand with some gravel mixed with pieces of asphalt, bricks, and concrete construction and demolition material. Under slab soil voids were observed at some of the test pit locations. Photos taken during test pit investigations are included in Appendix B.

As discussed in Section 3.2 of this report, the subsurface consists of an average of 10-foot thick, generally medium to dense fill stratum (Stratum 1), over a layer of thick soft to medium organic / non-organic silt or clay (Stratum 2) about 40 to 70 feet thick, over a layer in excess of 20 feet thick of dense to very dense sand (Stratum 3).

The garage was constructed in 1929. The garage floor consists of an existing, reinforced concrete slab supported by grade beams constructed in an "H" pattern underneath the slab as shown on Figure 2. Grade beams are supported by piles. Piles are advanced to unknown depths. Due to the settlement of existing slab on grade and other areas within the building footprint, settlement cracks were observed on the exterior of the garage structure. Photos of cracks due to settlements are shown in Appendix B.

The controlling factor for this development is that the proposed improvements will be conducted inside the garage and close to existing load-bearing elements (i.e., columns, walls, etc). Therefore, during excavation and construction, provisions should be made to maintain the structural integrity of the existing structure.



#### **4.1.1. Concrete Slab**

The existing concrete slab does not have any significant cracks; however based on site observation the whole slab settled about 2 to 3 inches. Based on test pit logs the concrete slab is reinforced with steel rebar and has a thickness ranging from 6 to 12- inches. In some areas, the reinforced concrete slab is overlain by an asphalt pavement which is up to 3 inches in thickness.

#### **4.1.2. Grade Beams**

Based on test pits, grade beams are 18 inches in depth. The grade beams are supported on piles. Slabs tie in at grade beams through raised concrete joints.

#### **4.1.3. Existing Piles / Pile Caps Footers**

Not much information is available to Berger in regard to existing piles / pile caps installed within the footprint of the garage structure. The only information available is that pile caps connect with grade beams. However, locations of piles / pile caps and depth of installation is unknown.

#### **4.1.4. Existing Slab Rehabilitation**

In an attempt to extend the service life of the existing reinforced concrete slab, DOT made an effort to repair the slab by improving the subgrade supporting the slab via ground treatment. In areas where settlements were observed, DOT tried to jack up the existing slab to its original layers by controlled injection techniques.

Subgrade improvement to strengthen the slab support consisted of the drilling of about one (1)-inch diameter holes in a three (3)-foot grid and injecting a lean water/cement mix or polyurethane grout to an average depth of six (6) feet below the slab bottom elevations. In As general industry practice, injection pressures, in the case of a water-cement mix, or mix volumes and temperature, could be adjusted so the slab could be jacked up as much as one inch to level in areas where settlements were observed. Settlement was observed at joints only, and no major cracking was observed in the slab. Either the injection mix or a crack sealant was used by DOT to repair any minor surface cracks.

### **4.2. Robert Silman Slab Options Memo**

Based on the Silman memorandums dated January 26, 2010 (by Nat Oppenheimer) and April 22, 2010 (by Matt Bussman) and additional onsite conversations with Errol Silva (NYCDDC Structures Unit), the following alternatives for slab rehabilitation at the Harper Street DOT Garage are being considered by the DDC. The Robert Silman Slab Options Memorandums are included in **Appendix A**. The memo includes manual sketches of the proposed options.

The four options considered in this Foundations Recommendations Report are discussed below.

#### **4.2.1 Option A1 – Pour new reinforced concrete slab over the existing settling slab**

Option A1 consists of pouring a new lightly reinforced slab on grade over the existing slab. Silman stated in their memo that there is a concern of the new slab resettling within a couple of years of the pour. Option A1 would be the least expensive of the options recommended by Silman.

#### **4.2.2 Option A2 – Remove existing slab, compact subbase, and place new slab**

Option A2 consists of demolishing the existing slab on-grade, re-compacting the subbase soils and filling the existing under slab soil voids as required, and placing a new lightly reinforced slab in lieu of the existing slab.

#### **4.2.3 Option B – New load bearing piles and tie slab into new piles**

Option B proposed by Silman consists of the installation of new piles within the garage building footprint which carry a new structural slab that would span between the new piles. The following quantities were estimated by Robert Silman, based on building dimensions of 80' x 180'.

- (90) 40 ton piles driven beyond 70', which is approximate depth of 'good soil'
- 400 cubic yards of normal weight of concrete
- 40 tons of reinforcing
- Demo and carting of existing slab

#### **4.2.4 Option C**

Option C consists of the construction of a series of grade beams and a new supported slab that all bear on the existing slab. However, this system relies on the unknown strength of the existing interior grade beams and piles.

According to onsite conversations between Berger personnel and Errol Silva from the NYCDDC Structures Unit, Option C is no longer being considered.

### **4.3. Earthwork**

Unless the environmental conditions dictate otherwise, the excavated fill material may be suitable for re-use during the construction of the new floor slab only after sieving, if it is a feasible alternative. The excavated fill (stratum 1) will need to be screened to meet the following gradation criteria:

- Maximum particle size – four (4) inches
- No more than 50% by weight retained on the ¾-inch sieve



- No more than 30% by weight passing the #50 sieve
- No more than 7% by weight passing the #200 sieve, non-plastic

#### **4.4 Corrosion and Sulfate Attack Potential**

Soil resistivity and soil chemical tests, including tests for soluble sulfate and chloride contents, were performed on selected soil samples to evaluate the preliminary corrosion potential for ferrous metals (i.e., uncoated steel) and sulfate attack on concrete. Tested soil samples were collected from the soils at or near the proposed foundation elevations. The test results are presented in Appendix D.

Analyses of the soil samples show that the concentration of sulfate (as  $\text{SO}_4$ ) ranged from 80 ppm to 330 ppm and that of chloride (Cl) ranged between 45 ppm and 165 ppm. The soil resistivity values ranged from 2,200 ohm-cm to 11,000 ohm-cm. The concentrations of sulfate in soil indicate a “negligible to mild” potential for sulfate attack on concrete (based on ACI 318 Table 4.3.1). Therefore, dense concrete, with low water/cement ratio (maximum 0.45) of Type I or Type II Portland cement in contact with soil can be used in all foundation concrete and concrete in contact with soil. Buried concrete should be dense and fully compacted, and the minimum cement content requirement of ACI should be observed.

Similarly, the chloride contents and resistivity values indicate a “negligible” to “mild” potential of corrosion to uncoated, ferrous metals (such as reinforcing bars, steel pipes or other steel members of the structure in contact with the soil). A minimal cover for reinforcement steel, in accordance with ACI requirements, should be provided. Pipes in contact with soil should also be protected in accordance with the manufacturer’s recommendations.

#### **4.5 Seismic Considerations**

Seismic design parameters should conform to the requirements of the Building Code of New York City. Based on the recent borings, the soil at the site, at or below the groundwater table, is granular and consists of medium dense, medium to coarse sand and gravel. Therefore, the site has a low susceptibility to liquefaction under seismic loading.

In design, the seismic Zone Factor,  $Z$ , of 0.15, and a site coefficient,  $S$ , of 1.5, Soil Profile Type S3 can be used.



## 5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the forementioned engineering evaluation, the following conclusions and recommendations are provided:

11. Minor cracking in the exterior façade of the garage and settlement of the existing concrete slab indicate structural issues for the building foundation.
12. This report is based on the field borehole and test pit data, laboratory test results and general information for the proposed development. Subsurface conditions at the site consist of (from top to bottom):

Stratum 1- an approximately 10-foot thick, generally medium to dense fill stratum;  
Stratum 2- an approximately 40 to 70-foot thick soft to medium organic / non-organic silt or clay), underlain by  
Stratum 3- dense to very dense sand

Groundwater was observed between 5 to 6 feet below the existing grade.

13. Settlement is most likely to occur within Stratum 2. The total settlement cannot be estimated without knowing the structure loads and the pile construction details.
14. The three alternatives being considered by DDC, based on Robert Silman Associates' memo dated January 26, 2010 authored by Nat Oppenheimer and additional conversation with Errol Silva (DDC Structures Unit), are:
  - d. Option A1 Pour new reinforced concrete slab over the existing settling slab.
  - e. Option A2 Remove existing slab, compact subbase, and place new slab
  - f. Option B New load bearing piles and slab ties into new piles
15. Response to Option A1: The existing slab does not have any significant cracks and observations indicated that the slab was in good condition. This indicates the existing reinforced slab is strong enough to carry the settlement without cracking. The concern at the Site is settlement of the whole slab (estimated 2 to 3 inches). Option A1 would create a new smooth surface on top of the slab which would correct cracking; however, Option A1 will not address settlement which is the primary concern at the Site.
16. Response to Option A2: This Option is similar to Option A1 in that it would repair any damage within the building slab, but not address the underlying issue of settlement unless the subgrade were to be overexcavated and replaced with lightweight fill, which may reduce the loads and therefore settlement in Stratum 2. If the top ~6 feet was to be excavated and replaced with ~5 feet of light fill and one foot of slab, the stress on Stratum 2 could be reduced; however, without the building loads and pile construction details it is difficult to evaluate the effectiveness of this in reducing settlement.

If the entire floor slab were to be replaced, it is recommended that it be saw cut to minimize vibrations which may cause damage to the utility pipes, windows or other sensitive structures. The use of a jack-hammer (small, one-man operated) should only be allowed after recording and observing the level of vibrations, in terms of peak particle velocity, to be limited to below 0.10 in/s at frequencies greater than 40 Hertz at the column or load-bearing wall locations closest to the jack-hammer work area. Naturally, during saw cutting or breaking the slab with a jack-hammer, measures to mitigate the dust and noise impacts will be taken. Additionally, care should be taken to avoid damage to utilities.

After removal of the existing floor slab, in order to provide a satisfactory subgrade, the following site preparation would be required:

- Cut two feet below the bottom of the existing slab. If available, recycle the concrete slab pieces by producing  $\frac{3}{4}$ -inch sized stone for future use (see below). If this is not possible, or cost-effective, dispose of the removed slab pieces as well as excavated soils.
- Compact the exposed surface (at two feet below) to 95% of the maximum dry density (of the Stratum 1 fill, sand), as determined in ASTM D 1557. During compaction, ensure that vibrations remain below 0.10 in/s at the nearest column or load-bearing wall locations to avoid damage to the existing facilities, or the foundations.
- Place four feet of lightweight aggregate with a maximum unit weight of 70 pcf in six (6)-inch thick lifts. Compact each lift to 95% of the maximum dry density of the lightweight aggregate as determined in ASTM D 1557. During compaction, ensure that vibrations remain below 0.10 in/s to avoid damage to the existing facilities or the foundations. Bring the fill to 6 inches below the bottom elevation of the floor slab.
- Place a six (6)-inch thick layer of  $\frac{3}{4}$ -inch size crushed stone for under-slab drainage (use recycled slab concrete, if recovered). Compact crushed stone in six overlapping passes using a compactor with a foot pressure of about 100 psi. Ensure that excessive vibrations are not generated to cause damage to the existing structures and facilities.
- Place a vapor barrier and construct the slab as designed by others.
- Unless recommended otherwise by the project structural engineer, place a 12-inch thick, reinforced concrete slab. .

Due to use of the lightweight fill, the stress imposed on the subgrade will be reduced, potentially reducing future settlement.

Option A2 may be viable pending further design analysis.

17. Response to Option B: The settlement is likely occurring within Stratum 2. Transferring the loads to suitable soils below Stratum 2, via new piles, would eliminate settlement. However, driving piles would likely not be viable due to overhead clearance and vibration concerns.

Of the potentially available pile types (H-piles, pipe piles and mono-tube piles, and drilled piles, including continuous flight auger piles (CFA-piles), micropiles and a helical micropile foundation system (e.g., screw-type Chance piles)), micropiles are considered to be the most suitable foundation support for this project.

Micropiles consist of a continuous threaded, hollow reinforcing tendon as the load-carrying steel member, together with a grout body of portland cement with 5,000 psi strength, which allows the transfer of tension and compression forces—mainly from the friction of the threaded tendon via the grout body—into the bearing stratum of sand of both the fill (Stratum 1) and the underlying silty sand (Stratum 3), below the clay/silt layers. Generally, the micropiles are installed using a standard rotary or rotary percussive drill rig in a one-visit drilling operation. The installation procedure uses a grout flush to stabilize the annulus, consequently eliminating the use of casings. The installation of the micropiles is also almost free from vibration and has a low noise level. In addition, micropiles require smaller holes and work with small rigs, which results in less drill spoil and relatively lower mobilization costs. During the installation of the micropiles, grout should be selected with a water-to-cement ratio of 0.4, and the grout should be pumped using a minimum pressure of 300 psi. Based on the subsurface conditions, piles would have to extend a minimum of up to 80 ftb into Stratum 3 to reach suitable bearing material.

For higher pile capacity requirements, longer micropiles would be required.

18. There are other possible alternatives which may be evaluated. For example, an option which can be considered is an arc floating slab by constructing a lower slab about 5 ftb and leave void construct the upper slab as part of the floor support.
19. Based on the soil resistivity and soil chemical test results, the concentrations of sulfate in the soil indicate a “negligible to mild” potential for sulfate attack on concrete. Therefore, dense concrete with a maximum water/cement ratio of 0.45 of Type I or Type II Portland cement in contact with soil can be used in all foundation concrete and concrete in contact with soil and water. Buried concrete should be dense and fully compacted, and the minimum cement content requirement of ACI should be observed. Similarly, chloride contents indicate a “negligible” to “mild” potential of corrosion to uncoated, ferrous metals (such as reinforcing bars, steel pipes or other steel members of the structure in contact with the soil). A minimal cover for reinforcement steel in accordance with ACI requirements should be provided. Pipes in contact with soil should also be protected in accordance with the manufacturer’s recommendations.



20. It is recommended that the subgrade preparation for the new floor slab and the micropile design and installation should be made under the supervision of a New York Registered Professional Engineer.

## 6.0 LIMITATIONS

Our professional geotechnical engineering services have been performed using a degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical consultants practicing in this or similar localities. No other warranty, expressed or implied, is made as to the professional advice included in this report. This report has been prepared by Berger for the New York City Department of Design and Construction, to be used solely for the floor rehabilitation at the Harper Street Yard Garage, located at 32-11 Harper Street, Corona, Queens, NY. The report has not been prepared for use by other parties, and may not contain sufficient information for the purposes of other parties or other uses.

The recommendations provided in this report are based upon our understanding of the described project information and on our interpretation of the data collected during this subsurface exploration. The locations and the number of borings were selected based on access to the site. Our recommendations, therefore, are based on this limited data and are based upon experience with similar subsurface conditions. The recommendations apply to the specific project discussed in this report; therefore, the locations and the design of the structure, its configuration, loads, location or site grades should be provided to Berger so we can review our conclusions and recommendations and make any necessary modifications.

Regardless of the thoroughness of a geotechnical exploration, the possibility that subsurface conditions between boreholes and test pits may be different from those at specific test locations is present, and that conditions may be different than those anticipated by the designers or contractors. Specifically, some areas of the site were not accessible for exploratory borings. In addition, the construction process may itself alter soil conditions. Therefore, experienced geotechnical personnel should observe and document the construction procedures used and the conditions encountered. Unanticipated conditions and inadequate procedures should be reported to the design team, along with timely recommendations to solve the problems created.

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## DOOR SCHEDULE

\*ALL DOOR DIMENSIONS TO BE VIF PRIOR TO ORDERING

DOOR NO.	TYPE	HEIGHT	WIDTH	THICK- NESS	DOOR MATERIAL	MANUFACTURER	DOOR FRAME	DOOR + FRAME FINISH	HARD- WARE	ADDITIONAL NOTES
D1 / D2	Exterior Storefront Swing	6'-8"	3'-0"	2"	INS. GLASS + ALUM	Option 1: OldCastle Thermal Entrance System w/ narrow stile	ALUM.	DF1	A, B, C, D, E, F	1" Insul. Glass: 1/4" tempered ext. Lite, 1/4" tempered int. lite w/ air gap. All glass to be low iron clear tempered.
				2-1/4"		Option 2: Kawneer AA250 w/ narrow stile				
				2"		Option 3: EFCO D202 Thermal w/ narrow stile				
D3	Interior Metal Swing	7'-0"	4'-0"	1-3/4"	STL. COMPOSITE	Option 1: Republic Doors	HOLLOW METAL	DF2	A, E, G	2 hour fire-rated
						Option 2: Securall				
						Option 3: Door Components				

## DOOR HARDWARE TYPES

KEY	HARDWARE SET	MANUFACTURER/TYPE	FINISH	ADDITIONAL NOTES
A	Hinge	Option 1: Old Castle BH-1	SS	
		Option 2: Kawneer Butt Hinge 4-1/2"x 4"		
		Option 2: EFCO Butt Hinge 5"x 4-1/2"		
B	Exterior Pull	Option 1: OldCastle - Adams-Rite 4593	Matte alum., satin chrome, or sim.	See Adams-Rite for installation + hardware specs on 2" door
		Option 2: Kawneer - Adams-Rite 4593		
		Option 3: EFCO - Adams-Rite 4593		
C	Deadlatch	Option 1: OldCastle - Adams-Rite 4900	Matte alum., satin chrome, or sim.	Incl. cylinder
		Option 2: Kawneer - Adams-Rite 4900		
		Option 3: EFCO - Adams-Rite 4900		
D	Weather strip	Option 1: OldCastle DLO-251 Door Bottom Weatherstrip		
		Option 2: Kawneer Weatherstrip incl.		
		Option 3: EFCO Weatherstrip incl.		
E	Threshold	Option 1: 1/2" HAGER 426S	Aluminum clr. Anodized	
		Option 2: 1/2" Pemko 2549		
		Option 3: 1/2" CRLaurence S19ACL		
F	Lever	Option 1: OldCastle - Adams-Rite 4568	Matte alum., satin chrome, or sim.	
		Option 2: Kawneer - Adams-Rite 4568		
		Option 3: EFCO - Adams-Rite 4568		
G	FR Mortise lock w/ lever and strike. Grade 1. FR45	Option 1: HAGER 3800 - Escutcheon	SS	
		Option 2: Sargent 7900 Mortise lock line		
		Option 3: Corbin Russwin ML2000 - NSV		

## DOOR + DOOR FRAME FINISH KEY

KEY	DESCRIPTION	MANUFACTURER	MODEL / COLOR CODE
DF1	Shop or factory applied paint finish	Option 1: OldCastle - Fluropon	RAL1018
		Option 2: Kawneer - Permafluor	
		Option 3: EFCO - AkzoNobel Ultrapon	
DF2	Grey metallic paint finish	PPG	Duranar XL "Silver Shadow" UC 106707XL

WINDOW SCHEDULE					*ALL WINDOW DIMENSIONS TO BE VIF PRIOR TO ORDERING		
WINDOW	TYPE	HEIGHT	WIDTH	THICKNESS	GLAZING MATERIAL	FRAME (SEE KEY BELOW)	
W1	A	3'	16'	1"	Insulated Glass	Aluminum	

WINDOW KEY				
KEY	DESCRIPTION	MANUFACTURER	MODEL/ DESCRIPTION	FRAME FINISH COLOR
A	Ins. Glass Unit w/ air gap w/ Alum. Thermal system	Option 1: OldCastle	Zero Sightline Series 30P w/o vertical post at center (silicone only)	Int Lite: 1/4" Starfire low iron clear Temp. gl. Ext Lite: 1/4" Starfire low iron clear Temp. gl. Frame: Fluorospar Black 358X500
		Option 2: Wausau	6250 SUPERWALL SSG w/o plate cover and w/o vertical post at center (silicone only)	Int Lite: 1/4" Starfire low iron clear Temp. gl. Ext Lite: 1/4" Starfire low iron clear Temp. gl. Frame: Linetec Black LT601
		Option 3: EFCO	EFCO - 5600 Fixed Shadowline fixed w/o vertical post at center (silicone only)	Int Lite: 1/4" Starfire low iron clear Temp. gl. Ext Lite: 1/4" Starfire low iron clear Temp. gl. Frame: Ultrapon Black

SKYLIGHT SCHEDULE					*ALL SKYLIGHT DIMENSIONS TO BE VIF PRIOR TO ORDERING		
SKYLIGHT	TYPE	HEIGHT	WIDTH	GLAZING MATERIAL	FRAME (SEE KEY BELOW)	NOTES	
S1, S2	A	8'	15'-10"	Polycarbonate dome	Aluminum		
S3, S4	A/C	8'	15'-10"	Polycarbonate dome	Aluminum	See Schedules and A-120 / A-122	
S5-S16	A	8'	16'-7"	Polycarbonate dome	Aluminum		
S17, S18	B	8'	15'-10"	Hi-impact modified acrylic	Aluminum		
S19	A	8'	17'-4"	Polycarbonate dome	Aluminum		
S20	B,D	8'	15'-10"	Hi-impact modified acrylic	Aluminum		
S21	A,C	8'	15'-10"	Polycarbonate dome	Aluminum	See Schedules and A-120 / A-122	
S22	B,D	8'	17'-4"	Hi-impact modified acrylic	Aluminum		
S23, S24	A	7'	10'-6"	Polycarbonate dome	Aluminum		

SKYLIGHT KEY				
KEY	DESCRIPTION	MANUFACTURER	MODEL/ DESCRIPTION	FRAME FINISH COLOR
A	Typical Skylight	Option 1: Acralight	Cluster model with double dome on 4" curb	Duranar Eclipse Grey (UC106669/5MA86799)
		Option 2: Wasco	Model CL Cluster Skydome with 4" curb	Colonial Gray
		Option 3: Bristolite	Continuous Grid Modular w/ Polycarbonate Domes on 4" curb	Duranar Eclipse Grey (UC106669/5MA86799)
B	Impact Resistant Skylight	Option 1: Acralight	Cluster model with double dome on 4" curb	Duranar Eclipse Grey (UC106669/5MA86799)
		Option 2: Wasco	Model CL Cluster Skydome with 4" curb	Colonial Gray
		Option 3: Bristolite	Continuous Grid Modular w/ Polycarbonate Domes on 4" curb	Duranar Eclipse Grey (UC106669/5MA86799)
C	Gravity Operated Dropout Vent Skylight	Manufacturer: Acralight	Tandem unit with alum. gravity operated dropout w/ skydome	Duranar Eclipse Grey (UC106669/5MA86799)
		Dist. 1: Impact PTS Skylights		
		Dist. 2: CBG Assoc. Inc		
D	Impact Resistant and Gravity Operated Dropout Vent Skylight	Manufacturer: Acralight	Tandem unit with alum. gravity operated dropout w/ skydome	Duranar Eclipse Grey (UC106669/5MA86799)
		Dist. 1: Impact PTS Skylights		
		Dist. 2: CBG Assoc. Inc		
		Dist. 3: DAL Associates, LLC		

## EXTERIOR FINISH SCHEDULE

LOCATION	DESCRIPTION	MANUFACTURER	COLOR/FINISH KEY	ADDITIONAL NOTES
MONITORING BOOTH				
Porch + Stair + Conc. Curb	Exposed concrete		C1	
Exterior Tiles	Porcelain Tiles (freeze / thaw resistant)	Manuf: TopCer	T1+T2	w/ exterior grade, UV resistant, penetrating sealant. See A-501 for tile layout.
		Dist 1: Nemotile		
		Dist 2: Genesee Ceramic Tile		
		Dist 3: Mees Distributors		
Corrugated Metal	Aluminum	Option 1: Corrugated Metals, Inc. 1/4" Corrugated Siding	P1	
		Option 2: Fabral, 1/4" Corrugated Siding	P1	
		Option 3: Metal Roofing Source, 1/4" Corrugated Siding	P1	
Metall Bollard on Diesel Station and Monitoring Booth	Stainless Steel		SS	
Metal Curb on Concrete Island	Stainless Steel Curb	Option 1: Formex	SS	
		Option 2: Riverside Steel	SS	
		Option 3: Baker Industries Northwest	SS	
Fascia	Aluminum		P1	
Coping, Tile trims	Stainless Steel		SS	
Exterior Handrail	Galv. Steel	Manuf: Wagner		
		Dist. 1: Mid City Steel Corp.		
		Dist. 2: Ping Ping Products Corp.		
		Dist. 3: DJA Imports, Ltd.		
Rainspout	Stainless Steel			
Membrane Roofing	White EPDM roofing	Option 1: Carlisle-Syntec	Sure-white	
		Option 2: Firestone	Eco White	
		Option 3: Versico	Versigard White	
M+R BUILDING				
Membrane Roofing	EPDM roofing	Option 1: Carlisle-Syntec; Sure tough reinforced EPDM	Black	
		Option 2: Firestone; Rubber guard EPDM	Black	
		Option 3: Versico; Versigard	Black	
Asphalt Roofing (replace in kind)	Asphalt shingles	Option 1: GAF Roofing	Color + spec. to match exist.	
		Option 2: CertainTeed	Color + spec. to match exist.	
		Option 3: Atlas Roofing	Color + spec. to match exist.	
Flashing and coping	Stainless Steel			
Bricks	Replacement bricks- identify brick and match existing			
EXTERIOR COLOR SCHEDULE KEY				
KEY                      COLOR DESCRIPTION				
T1	TopCer Black, 7.5cm x 15cm, Grout color - T.B.D.			
T2	TopCer White, 7.5cm x 15cm, Grout color - T.B.D.			
P1	Shop or factory spray painted w/ PPG Industries,Corafon ADS Intermix, AD3C1016N, Yellow, Satin sheen			
C1	Scofield Chromix Charcoal C-24 with liquid sealer / densifier			

## INTERIOR FINISH SCHEDULE

LOCATION	DESCRIPTION	MANUFACTURER	COLOR/FINISH KEY	ADDITIONAL NOTES
M+R Elec. Rm. Stair Tread	Pre-fab bar grille treads	Option 1: MC NICHOLS GW	Galvanized Stl. w/clear finish	See A-401 for stair details.
		Option 2: OHIO GRATINGS	Galvanized Stl. w/clear finish	See A-401 for stair details.
		Option 3: AMICO GRATING	Galvanized Stl. w/clear finish	See A-401 for stair details.
		welded plain 1-1/2" x 3/16" bearing bars 1-3/16" O.C. x 4' w/ checkered plate nosing		
M+R Elec. Rm. Stair rail and stringer	Welded stl. tubes + channels, hot dip galvanized		Galvanized Stl. w/clear finish	See A-401 for stair details.

LOCATION	FLOOR	CLNG	WALLS	BSBD	ADDITIONAL NOTES
MONITORING BOOTH	C2	W1	W1	B1	3 coats clear poly, satin finish on both walls and ceiling
M+R BUILDING: ELECTRICAL ROOM	C1	Exist.	P2	Exist.	
M+R BUILDING: TRUCK REPAIR ROOM	C3	Exist.	Exist.	Exist.	

## INTERIOR COLOR SCHEDULE KEY

KEY	COLOR DESCRIPTION
C2	Polished concrete: Scofield Chromix Charcoal C-24 with liquid sealer / densifier
C3	Self-leveling concrete grey: see 033000 cast-in-place concrete, M&R Building
W1	Quartersawn Red Oak veneer on 1/2" ply
B1	Vinyl baseboard: Armstrong, grey to match C2 concrete
P2	CMU Block, ptd.: Benjamin Moore "Icicle" OC-60, Eggshell

**CUSTOM MILLWORK SCHEDULE**

LOCATION / ITEM	MATERIAL	COLOR/ FINISH	NOTES
Monitoring Booth-Desk	Quartersawn Red Oak veneer on ply + solid Oak trim at edge to match veneer	3 coats clear poly, satin finish	See A-504

**MILLWORK FINISH HARDWARE SCHEDULE**

LOCATION / ITEM	MANUFACTURER	MODEL NAME / NO.	FINISH
Brackets	Option 1: Rakks	EH1818 SS	
	Option 2: Federal Brace	Streamline Counter Top Bracket 18x18 SS	
	Option 3: ACP	Streamline Bracket 18x18 SS	

**MONITORING BOOTH FURNITURE SCHEDULE**

LOCATION / ITEM	MANUFACTURER	MODEL NAME / NO.	FINISH
Metal shelves	Option 1: HON	Brigade HS42ABCP	Black
	Option 2: Sandusky	Elite Welded Bookcase BA20361242-09	Black
	Option 3: Global Industrial	All Steel WG277440BK	Black

## ELECTRICAL & LIGHTING FIXTURES SCHEDULE

LOCATION	TYPE	MANUFACTURER/ MODEL NO.	FINISH / NOTE
FUELING STATION	LED Cobra	Manuf.: BetaLED / LEDway Streetlight - Type 5 Medium	
		Dist 1: Stan Deutsch Associates	
		Dist 2: Ferrini & Knoarski	
		Dist 3: Penn Lighting	
	Light Pole	Manuf: Millerbermd. Model: 20' TSLP-E traffic light pole with 6' twin arm and Steel "T" base	Hot Dipped Galvanized; see X-113
		Dist 1: Spectrolume, NY	
		Dist 2: Spec lines, MA	
MONITORING BOOTH	Interior ceiling mounted recessed LED fixture	Manufacturer: LED Neoray S22DR-1L35-STG-4D-1ED-S92HT	White
		Dist. 1: YB Lighting	
		Dist. 2: AVON Lighting	
		Dist. 3: Enterprise Lighting	
	Exterior wall mounted LED fixture	Manufacturer: Lumenbeam medium	Die cast alum.
		Dist.1: International Lights	
		Dist. 2: Quality Lighting	
		Dist. 3: Lighting Affiliates	
	Exterior motion sensor switch	Manufacturer: WattStopper EW-205-24	
		Dist. 1: Conserve Electrical Supply Corp.	
		Dist. 2: I.G. Federal Electric Supply	
M&R BUILDING	Standard Fluorescent Strip	Option 1: Legion/ Microstrip T5 Series 1600	White
		Option 2: Delray/ST5	White
		Option 3: American Fluorescent/T5 Low Profile	White
MONITORING BOOTH / M&R BUILDING	Interior light switch	Option 1: Leviton Decora Style	White
		Option 2: Lutron Diva	White
		Option 3: Siemens Delta	White



MS ID: HWQF027C



THE CITY OF NEW YORK  
DEPARTMENT OF DESIGN AND CONSTRUCTION  
DIVISION OF PUBLIC BUILDINGS

130 THOMSON AVENUE LONG ISLAND CITY, NEW YORK 11101-3045  
TELEPHONE (718) 391-1000 WEBSITE [www.nyc.gov/buildnyc](http://www.nyc.gov/buildnyc)

Contract for Furnishing all Labor and Material Necessary and Required for:

CONTRACT NO. 1 GENERAL CONSTRUCTION WORK

Harper Street Yard Construction of  
New Diesel Station, Electrical, Roof &  
Floor Upgrade

LOCATION: 32-11 Harper Street  
DROUGH: Queens 11368  
CITY OF NEW YORK

Contractor

Dated \_\_\_\_\_, 20\_\_\_\_

Entered in the Comptroller's Office

Assistant Bookkeeper

Dated \_\_\_\_\_, 20\_\_\_\_

