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PHILADELPHIA WATER DEPARTMENT GREEN STORMWATER INFRASTRUCTURE  
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**SECTION 024119**  
**SELECTIVE DEMOLITION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Demolition and removal of selected portions of building or structure.
  - 2. Salvage of existing items to be reused or recycled.

**1.2 DEFINITIONS**

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

**1.3 PREINSTALLATION MEETINGS**

- A. Predemolition Conference: Conduct conference at Project site.

**1.4 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For refrigerant recovery technician.
- B. Predemolition Photographs or Video: Submit before Work begins.
- C. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician.

**1.5 CLOSEOUT SUBMITTALS**

- A. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.6 QUALITY ASSURANCE

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

1.7 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
  - 1. Before selective demolition, Owner will remove the following items:
    - a. Furniture.
    - b. Gym equipment.
    - c. Casework and closet contents.
    - d. Storage area contents.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
  - 1. Hazardous materials will be removed by Owner before start of the Work.
  - 2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Hazardous Materials: Hazardous materials are present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
  - 1. Hazardous material remediation is specified elsewhere in the Contract Documents.
  - 2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
- F. Storage or sale of removed items or materials on-site is not permitted.
- G. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  - 1. Maintain fire-protection facilities in service during selective demolition operations.

## 1.8 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- D. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
- E. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
  - 1. Comply with requirements specified in Section 013233 "Photographic Documentation."

### 3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
  - 1. Comply with requirements for existing services/systems interruptions specified in Section 011000 "Summary."

- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
  2. Arrange to shut off indicated utilities with utility companies.
  3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
  4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.
    - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
    - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
- C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

### 3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

### 3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
  2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
  4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  5. Dispose of demolished items and materials promptly.
- B. Removed and Salvaged Items:
1. Clean salvaged items.
  2. Pack or crate items after cleaning. Identify contents of containers.
  3. Store items in a secure area until delivery to Owner.
  4. Transport items to Owner's storage area designated by Owner.
  5. Protect items from damage during transport and storage.
- C. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
  2. Pack or crate items after cleaning and repairing. Identify contents of containers.
  3. Protect items from damage during transport and storage.
  4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

### 3.5 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be **recycled,** reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

### 3.6 CLEANING

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

END OF SECTION 024119

## SECTION 033053

### MISCELLANEOUS CAST-IN-PLACE CONCRETE

#### PART 1 - GENERAL

##### 1.1 SUMMARY

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

##### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Other Action Submittal:
  - 1. Design Mixtures: For each concrete mixture.

##### 1.3 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. Comply with ACI 301.
- C. Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

#### PART 2 - PRODUCTS

##### 2.1 FORMWORK

- A. Furnish formwork and formwork accessories according to ACI 301.

##### 2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Wire: ASTM A 82, galvanized.

- C. Galvanized-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from galvanized steel wire into flat sheets.

## 2.3 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, Gray
- B. Normal-Weight Aggregate: ASTM C 33, graded, 1-1/2 inch nominal maximum aggregate size.
- C. Water: ASTM C 94/C 94M.
- D. Synthetic Fiber: Monofilament or fibrillated polypropylene fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches long.

## 2.4 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. Retarding Admixture: ASTM C 494/C 494M, Type B.
  - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
  - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
  - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
  - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

## 2.5 RELATED MATERIALS

- A. Vapor Retarder: Plastic sheet, ASTM E 1745, Class A or B.
- B. Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick; or plastic sheet, ASTM E 1745, Class C.
- C. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.



## 2.6 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth or cotton mats.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

## 2.7 CONCRETE MIXTURES

- A. Normal-Weight Concrete: Prepare design mixes, proportioned according to ACI 301, as follows, for all exposure categories:
  - 1. Minimum Compressive Strength: 4000 psi at 28 days.
  - 2. Maximum Water-Cementitious Materials Ratio: 0.50
  - 3. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
  - 4. Slump Limit: 4 inches, plus or minus 1 inch.
  - 5. Air Content: Maintain within range permitted by ACI 301. Do not allow air content of trowel-finished floor slabs to exceed 3 percent.

## 2.8 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 above 90 deg F reduce mixing and delivery time to 60 minutes.

## PART 3 - EXECUTION

### 3.1 FORMWORK

- A. Design, construct, erect, brace, and maintain formwork according to ACI 301.

### 3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

### 3.3 VAPOR RETARDERS

- 1. Plastic Vapor Retarder: ASTM E1745, Class A or B, 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

### 3.4 STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
  - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
  - 2. Reinforcement Accessories:
    - a. Zinc Repair Material: ASTM A 780, zinc-based solder, paint containing zinc dust, or sprayed zinc.
    - b. 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:
      - i. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

### 3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Contraction Joints in Slabs-on-Grade: Form weakened-plane grooved contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness.
- C. Isolation Joints: Install joint-filler strips at junctions with slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
  - 1. Extend joint fillers full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

- D. Provide control joints at a spacing as required to prevent cracking.

### 3.6 CONCRETE PLACEMENT

- A. Comply with ACI 301 for placing concrete.
- B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
- C. Do not add water to concrete during delivery, at Project site, or during placement.
- D. Consolidate concrete with mechanical vibrating equipment.

### 3.7 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding 1/2 inch.
  - 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 defective areas. Remove fins and other projections exceeding 1/8 inch.
  - 1. Apply to concrete surfaces exposed to public view.
- C. Rubbed Finish: Apply the following rubbed finish, defined in ACI 301 to smooth-formed finished as-cast concrete where indicated:
  - 1. Smooth-rubbed finish.
  - 2. Grout-cleaned finish.
  - 3. Cork-floated finish.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

### 3.8 FINISHING UNFORMED SURFACES

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

- B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.
  - 1. Do not further disturb surfaces before starting finishing operations.
- C. Scratch Finish: Apply scratch finish to surfaces indicated and surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes, unless otherwise indicated.
- D. Float Finish: Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, fluid-applied or direct-to-deck-applied membrane roofing, or sand-bed terrazzo.
- E. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.
- F. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set methods. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.
- G. Nonslip Broom Finish: Apply a nonslip broom finish to surfaces indicated and to exterior concrete platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

### 3.9 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 with ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure formed and unformed concrete for at least seven days 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 lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in 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.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

### 3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified testing agency to perform tests and inspections.
- B. Tests: Perform according to ACI 301.
  1. Testing Frequency: One composite sample shall be obtained for each day's pour of each concrete mix exceeding 5 cu. yd. but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
  2. Testing Frequency: One composite sample shall be obtained for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.

### 3.11 REPAIRS

- A. Remove and replace concrete that does not comply with requirements in this Section.

END OF SECTION 033053

## SECTION 040120

### MAINTENANCE OF UNIT MASONRY

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes maintenance of unit masonry consisting of brick masonry restoration and cleaning as follows:
  - 1. Repairing unit masonry, including replacing units.
  - 2. Repointing joints.
  - 3. Preliminary cleaning, including removing plant growth.
  - 4. Cleaning exposed unit masonry surfaces.

##### 1.2 DEFINITIONS

- A. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.
- B. Medium-Pressure Spray: 400 to 800 psi; 4 to 6 gpm.

##### 1.3 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on masonry units as follows.
  - 1. Existing Brick: Test each type of existing masonry unit indicated for replacement, according to testing methods in ASTM C 67 for compressive strength, 24-hour cold-water absorption, 5-hour boil absorption, saturation coefficient, and initial rate of absorption (suction). Carefully remove five existing units from locations designated by Architect. Take testing samples from these units.
  - 2. Existing Mortar: Test according to ASTM C 295, modified as agreed by testing service and Architect for Project requirements, to determine proportional composition of original ingredients, sizes and colors of aggregates, and approximate strength. Use X-ray diffraction, infrared spectroscopy, and differential thermal analysis as necessary to supplement microscopical methods. Carefully remove existing mortar from within joints at five locations designated by Architect or testing service.
  - 3. Temporary Patch: As directed by Architect, provide temporary materials at locations from which existing samples were taken.
  - 4. Replacement Brick: Test each proposed type of replacement masonry unit, according to sampling and testing methods in ASTM C 67 for compressive strength, 24-hour cold-water absorption, 5-hour boil absorption, saturation coefficient, and initial rate of absorption (suction).

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each exposed product and for each color and texture specified.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Preconstruction test reports.

#### 1.6 QUALITY ASSURANCE

- A. Restoration Specialist Qualifications: Engage an experienced masonry restoration and cleaning firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience installing standard unit masonry is not sufficient experience for masonry restoration work.
  - 1. At Contractor's option, work may be divided between two specialist firms: one for cleaning work and one for repair work.
  - 2. Field Supervision: Restoration specialist firms shall maintain experienced full-time supervisors on Project site during times that clay masonry restoration and cleaning work is in progress.
  - 3. Restoration Worker Qualifications: Persons who are experienced in restoration work of types they will be performing. When masonry units are being patched, assign at least one worker among those performing patching work who is trained and certified by manufacturer of patching compound to apply its products.
- B. Mockups: Prepare mockups of restoration and cleaning to demonstrate aesthetic effects and set quality standards for materials and execution and for fabrication and installation.
  - 1. Masonry Repair: Prepare sample areas for each type of masonry material indicated to have repair work performed. If not otherwise indicated, size each mockup not smaller than 2 adjacent whole units or approximately 48 inches in least dimension. Erect sample areas in existing walls unless otherwise indicated, to demonstrate quality of materials, workmanship, and blending with existing work. Include the following as a minimum:
    - a. Patching: Three small holes at least 1 inch in diameter for each type of masonry material indicated to be patched, so as to leave no evidence of repair.
  - 2. Cleaning: Clean an area approximately 25 sq. ft. for each type of masonry and surface condition.
- C. Preinstallation Conference: Conduct conference at Project site.

## PART 2 - PRODUCTS

### 2.1 MASONRY MATERIALS

- A. Face Brick: Provide face brick, including specially molded, ground, cut, or sawed shapes where required to complete masonry restoration work.
  - 1. Provide units with physical properties, colors, color variation within units, surface texture, size, and shape to match existing brickwork.
    - a. Physical Properties per ASTM C 67.
    - b. For existing brickwork that exhibits a range of colors or color variation within units, provide brick that proportionally matches that range and variation rather than brick that matches an individual color within that range.
- B. Building Brick: Provide building brick complying with ASTM C 62, Grade SW where in contact with earth, Grade SW, MW, or NW for concealed backup; and of same vertical dimension as face brick, for masonry work concealed from view.

### 2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II, white or gray where required for color matching of exposed mortar.
  - 1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Mortar Sand: ASTM C 144 unless otherwise indicated.
  - 1. Color: Provide natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.
  - 2. For pointing mortar, provide sand with rounded edges.
  - 3. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
- D. Mortar Pigments: Natural and synthetic iron oxides, compounded for mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.
- E. Water: Potable.

### 2.3 MANUFACTURED REPAIR MATERIALS

- A. Masonry Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching masonry.



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. [Cathedral Stone Products, Inc.; Jahn M100 Terra Cotta and Brick Repair Mortar.](#)
  - b. [Conproco Corporation; Mimic or Matrix.](#)
  - c. [Edison Coatings, Inc.; Custom System 45.](#)
2. Use formulation that is vapor- and water permeable (equal to or more than the masonry unit), exhibits low shrinkage, has lower modulus of elasticity than the masonry units being repaired, and develops high bond strength to all types of masonry.
3. Formulate patching compound used for patching brick in colors and textures to match each masonry unit being patched.

## 2.4 PAINT REMOVERS

- A. Covered or Skin-Forming Alkaline Paint Remover: Manufacturer's standard covered or skin-forming alkaline formulation for removing paint coatings from masonry.
  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. [ABR Products, Inc.; Grip 'N Strip 800 Fast Acting.](#)
    - b. [Diedrich Technologies Inc.; 606 Multi-Layer Paint Remover or 606X Extra Thick Multi-Layer Paint Remover with pull-off removal system.](#)
    - c. [Dumond Chemicals, Inc.; Peel Away 1 System.](#)
    - d. [PROSOCO; Enviro Klean Safety Peel 1 or Enviro Klean Safety Peel 3 with Enviro Klean Overcoat.](#)
- B. Solvent-Type Paint Remover: Manufacturer's standard water-rinsable, solvent-type gel formulation for removing paint coatings from masonry.
  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. [ABR Products, Inc.; Super Bio Strip Gel.](#)
    - b. [Diedrich Technologies Inc.; 505 Special Coatings Stripper.](#)
    - c. [Dumond Chemicals, Inc.; Peel Away 2.](#)
    - d. [Hydroclean, Hydrochemical Techniques, Inc.; Hydroclean HT-300 Solvent Paint Remover.](#)
    - e. [Price Research, Ltd.; Price Strip-All.](#)
    - f. [PROSOCO; Sure Klean Fast Acting Stripper.](#)

Low-Odor, Solvent-Type Paint Remover: Manufacturer's standard low-odor, water-rinsable solvent-type gel formulation, containing no methanol or methylene chloride, for removing paint coatings from masonry.

2. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- a. [ABR Products, Inc.; Super Bio Strip Gel.](#)
- b. [Cathedral Stone Products, Inc.;](#) S-301, S-303 or S-305.
- c. [Dumond Chemicals, Inc.;](#) Peel Away 6, Peel Away 7 or Peel Away 21.
- d. [PROSOCO;](#) Enviro Klean Safety Peel 1 or Enviro Klean Safety Peel 3.

## 2.5 CLEANING MATERIALS

- A. Water: Potable.
- B. Hot Water: Water heated to a temperature of 140 to 160 deg F.
- C. Job-Mixed Detergent Solution: Solution prepared by mixing 2 cups of tetrasodium polyphosphate, 1/2 cup of laundry detergent, and 20 quarts of hot water for every 5 gal. of solution required.
- D. Job-Mixed Mold, Mildew, and Algae Remover: Solution prepared by mixing 2 cups of tetrasodium polyphosphate, 5 quarts of 5 percent sodium hypochlorite (bleach), and 15 quarts of hot water for every 5 gal. of solution required.
- E. Nonacidic Gel Cleaner: Manufacturer's standard gel formulation, with pH between 6 and 9, that contains detergents with chelating agents and is specifically formulated for cleaning masonry surfaces.
  1. **Products:** Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. [Price Research, Ltd.; Price Marble Cleaner-Gel.](#)
    - b. [PROSOCO; Sure Klean 942 Limestone and Marble Cleaner.](#)
- F. Nonacidic Liquid Cleaner: Manufacturer's standard mildly alkaline liquid cleaner formulated for removing mold, mildew, and other organic soiling from ordinary building materials, including polished stone, brick, aluminum, plastics, and wood.
  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. [Diedrich Technologies Inc.; Diedrich 910PM Polished Marble Cleaner.](#)
    - b. [Dominion Restoration Products, Inc.; Bio-Cleanse.](#)
    - c. [Dumond Chemicals, Inc.; Safe n' Easy Architectural Cleaner/Restorer.](#)
    - d. [Price Research, Ltd.; Price Non-Acid Masonry Cleaner.](#)
    - e. [PROSOCO; Enviro Klean 2010 All Surface Cleaner.](#)
- G. Mild Acidic Cleaner: Manufacturer's standard mildly acidic cleaner containing no muriatic (hydrochloric), hydrofluoric, or sulfuric acid; or ammonium bifluoride or chlorine bleaches.
  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. [ABR Products, Inc.; X-190 Limestone & Concrete Cleaner.](#)

- b. [Diedrich Technologies Inc.; Envirorestore 100.](#)
  - c. [Dominion Restoration Products, Inc.; DR-60 Stone and Masonry Cleaner.](#)
  - d. [PROSOCO; Enviro Klean BioWash.](#)
- H. Acidic Cleaner: Manufacturer's standard acidic masonry cleaner composed of hydrofluoric acid or ammonium bifluoride blended with other acids, detergents, wetting agents, and inhibitors.
- 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. [ABR Products, Inc.; 801 Heavy Duty Masonry Cleaner.](#)
    - b. [Diedrich Technologies Inc.;](#) Diedrich 101 Masonry Restorer or Diedrich 101G Granite, Terra Cotta, and Brick Cleaner.
    - c. [Dumond Chemicals, Inc.;](#) Safe n' Easy Ultimate Stone and Masonry Cleaner or Safe n' Easy Heavy Duty Restoration Cleaner.
    - d. [EaCo Chem, Inc.;](#) GS-Restoration or HD-Acid
    - e. [Hydroclean, Hydrochemical Techniques, Inc.; Hydroclean Brick, Granite, Sandstone and Terra Cotta Cleaner \(HT-626\).](#)
    - f. [Price Research, Ltd.;](#) Price Heavy Duty Restoration Cleaner or Price Restoration Cleaner.
    - g. [PROSOCO;](#) Enviro Klean Restoration Cleaner, Sure Klean Restoration Cleaner or Sure Klean Heavy-Duty Restoration Cleaner.

#### ACCESSORY MATERIALS

- I. Setting Buttons: Resilient plastic buttons, nonstaining to masonry, sized to suit joint thicknesses and bed depths of masonry units without intruding into required depths of pointing materials.

#### 2.6 MORTAR MIXES

- A. Measurement and Mixing: Measure cementitious materials and sand 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 materials and sand together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not retemper or use partially hardened material.
- B. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Architect's approval.
  - 1. Mortar Pigments: Where mortar pigments are indicated, do not exceed a pigment-to-cement ratio of 1:10 by weight.

- C. Do not use admixtures in mortar unless otherwise indicated.
- D. Mortar Proportions: Mix mortar materials in the following proportions:
  - 1. Pointing Mortar for Brick: 1 part portland cement, 2 parts lime, and 6 parts sand.
    - a. Add mortar pigments to produce mortar colors required.
  - 2. Rebuilding (Setting) Mortar: Same as pointing mortar.
  - 3. Rebuilding (Setting) Mortar: Comply with ASTM C 270, Proportion Specification, Type N unless otherwise indicated; with cementitious material limited to portland cement and lime.

## 2.7 CHEMICAL CLEANING SOLUTIONS

- A. Dilute chemical cleaners with water to produce solutions not exceeding concentration recommended by chemical-cleaner manufacturer.
- B. Acidic Cleaner Solution for Brick: Dilute with water to produce hydrofluoric acid content of 3 percent or less, but not greater than that recommended by chemical-cleaner manufacturer.

## PART 3 - EXECUTION

### 3.1 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work.
- B. Comply with chemical-cleaner manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical-cleaning solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.
  - 1. Cover adjacent surfaces with materials that are proven to resist chemical cleaners used unless chemical cleaners being used will not damage adjacent surfaces. Use materials that contain only waterproof, UV-resistant adhesives. Apply masking agents to comply with manufacturer's written instructions. When no longer needed, promptly remove masking to prevent adhesive staining.
  - 2. Keep wall wet below area being cleaned to prevent streaking from runoff.

### 3.2 BRICK REMOVAL AND REPLACEMENT

- A. Remove bricks that are damaged, spalled, or deteriorated. Carefully demolish or remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.

- B. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.
- C. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.
- D. Remove in an undamaged condition as many whole bricks as possible.
  - 1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
  - 2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents.
- E. Clean bricks surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.
- F. Replace removed damaged brick with other removed brick in good quality, where possible, or with new brick matching existing brick, including size. Do not use broken units unless they can be cut to usable size.
- G. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.
  - 1. Maintain joint width for replacement units to match existing joints.
  - 2. Use setting buttons or shims to set units accurately spaced with uniform joints.
- H. 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 both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.
  - 1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
  - 2. Rake out mortar used for laying brick before mortar sets and point new mortar joints in repaired area to comply with requirements for repointing existing masonry, and at same time as repointing of surrounding area.
  - 3. When mortar is sufficiently hard to support units, remove shims and other devices interfering with pointing of joints.

### 3.3 MASONRY UNIT PATCHING

- A. Patching Bricks:
  - 1. Remove loose material from masonry surface. Carefully remove additional material so patch will not have feathered edges but will have square or slightly undercut edges on area to be patched and will be at least 1/4 inch thick, but not less than recommended by patching compound manufacturer.
  - 2. Mask adjacent mortar joint or rake out for repointing if patch will extend to edge of masonry unit.
  - 3. Mix patching compound in individual batches to match each unit being patched.
  - 4. Rinse surface to be patched and leave damp, but without standing water.

5. Brush-coat surfaces with slurry coat of patching compound according to manufacturer's written instructions.
6. Place patching compound in layers as recommended by patching compound manufacturer, but not less than 1/4 inch or more than 2 inches thick. Roughen surface of each layer to provide a key for next layer.
7. Trowel, scrape, or carve surface of patch to match texture and surrounding surface plane or contour of the masonry unit. Shape and finish surface before or after curing, as determined by testing, to best match existing masonry unit.
8. Keep each layer damp for 72 hours or until patching compound has set.

### 3.4 CLEANING MASONRY, GENERAL

- 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. Ensure that dirty residues and rinse water will not wash over cleaned, dry surfaces.
- B. Use only those cleaning methods indicated for each masonry material and location.
  1. Do not use wire brushes or brushes that are not resistant to chemical cleaner being used. Do not use plastic-bristle brushes if natural-fiber brushes will resist chemical cleaner being used.
  2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage masonry.
    - a. Equip units with pressure gages.
  3. For chemical-cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray tip.
  4. For water-spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
  5. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.
- C. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces.
- D. Water-Spray Application Method: Unless otherwise indicated, hold spray nozzle at least 6 inches from surface of masonry and apply water in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.
- E. Chemical-Cleaner Application Methods: Apply chemical cleaners to masonry surfaces to comply with chemical-cleaner manufacturer's written instructions; use brush or spray application. Do not spray apply at pressures exceeding 50 psi. Do not allow chemicals to remain on surface for periods longer than those indicated or recommended by manufacturer.

- F. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.
  - 1. Apply neutralizing agent and repeat rinse if necessary to produce tested pH of between 6.7 and 7.5.

### 3.5 PRELIMINARY CLEANING

- A. Removing Plant Growth: Completely remove visible plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing to dry as long as possible before removal. Remove loose soil and debris from open masonry joints to whatever depth they occur.
- B. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to cleaning methods being used. Extraneous substances include paint, calking, asphalt, and tar.
  - 1. Carefully remove heavy accumulations of material from surface of masonry with a sharp chisel. Do not scratch or chip masonry surface.
  - 2. Remove paint and calking with alkaline paint remover.
    - a. Comply with requirements in "Paint Removal" Article.
    - b. Repeat application up to two times if needed.
  - 3. Remove asphalt and tar with solvent-type paint remover.
    - a. Comply with requirements in "Paint Removal" Article.
    - b. Apply paint remover only to asphalt and tar by brush without prewetting.
    - c. Allow paint remover to remain on surface for 10 to 30 minutes.
    - d. Repeat application if needed.

### 3.6 PAINT REMOVAL

- A. Paint Removal with Covered or Skin-Forming Alkaline Paint Remover:
  - 1. Remove loose and peeling paint using medium-pressure spray, scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
  - 2. Apply paint remover to dry, painted masonry with trowel, spatula, or as recommended by manufacturer.
  - 3. Apply cover, if required by manufacturer, per manufacturer's written instructions.
  - 4. Allow paint remover to remain on surface for period recommended by manufacturer or as determined in test panels.
  - 5. Scrape off paint and remover and collect for disposal.
  - 6. Rinse with hot water applied by medium-pressure spray to remove chemicals and paint residue.
  - 7. Apply acidic cleaner or manufacturer's recommended afterwash to masonry, while surface is still wet, using low-pressure spray equipment or soft-fiber brush. Let cleaner

or afterwash remain on surface as a neutralizing agent for period recommended by chemical-cleaner or afterwash manufacturer.

8. Rinse with hot water applied by medium-pressure spray to remove chemicals and soil.

B. Paint Removal with Solvent-Type Paint Remover:

1. Remove loose and peeling paint using medium-pressure spray, scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
2. Apply thick coating of paint remover to painted masonry with natural-fiber cleaning brush, deep-nap roller, or large paint brush.
3. Allow paint remover to remain on surface for period recommended by manufacturer.
4. Rinse with hot water applied by medium-pressure spray to remove chemicals and paint residue.

### 3.7 CLEANING MASONRY

A. Detergent Cleaning:

1. Wet masonry with cold water applied by low-pressure spray.
2. Scrub masonry with detergent solution using medium-soft brushes until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from mortar joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that masonry surface remains wet.
3. Rinse with hot water applied by medium-pressure spray to remove detergent solution and soil.
4. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

B. Mold, Mildew, and Algae Removal:

1. Wet masonry with hot water applied by low-pressure spray.
2. Apply mold, mildew, and algae remover by brush or low-pressure spray.
3. Scrub masonry with medium-soft brushes until mold, mildew, and algae are thoroughly dislodged and can be removed by rinsing. Use small brushes for mortar joints and crevices. Dip brush in mold, mildew, and algae remover often to ensure that adequate fresh cleaner is used and that masonry surface remains wet.
4. Rinse with hot water applied by medium-pressure spray to remove mold, mildew, and algae remover and soil.
5. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

C. Nonacidic Gel Chemical Cleaning:

1. Wet masonry with cold water applied by low-pressure spray.
2. Apply nonacidic gel cleaner in 1/8-inch thickness by brush, working into joints and crevices. Apply quickly and do not brush out excessively so area will be uniformly covered with fresh cleaner and dwell time will be uniform throughout area being cleaned.
3. Let cleaner remain on surface for period indicated below:



- a. As recommended by chemical-cleaner manufacturer.
  - b. As established by mockup.
4. Remove bulk of nonacidic gel cleaner by squeegeeing into containers for disposal.
  5. Rinse with hot water applied by medium-pressure spray to remove chemicals and soil.
  6. Repeat cleaning procedure above where required to produce cleaning effect established by mockup. Do not repeat more than once.
- D. Nonacidic Liquid Chemical Cleaning:
1. Wet masonry with cold water applied by low-pressure spray.
  2. Apply cleaner to masonry by brush. Let cleaner remain on surface for period indicated below:
    - a. As recommended by chemical-cleaner manufacturer.
    - b. As established by mockup.
  3. Rinse with hot water applied by medium-pressure spray to remove chemicals and soil.
  4. Repeat cleaning procedure above where required to produce cleaning effect established by mockup. Do not repeat more than once.
- E. Mild Acidic Chemical Cleaning:
1. Wet masonry with cold water applied by low-pressure spray.
  2. Apply cleaner to masonry by brush. Let cleaner remain on surface for period indicated below:
    - a. As recommended by chemical-cleaner manufacturer.
    - b. As established by mockup.
  3. Rinse with cold water applied by medium-pressure spray to remove chemicals and soil.
  4. Repeat cleaning procedure above where required to produce cleaning effect established by mockup. Do not repeat more than once.

### 3.8 REPOINTING MASONRY

- A. Rake out and repoint joints to the following extent:
1. Joints where mortar is missing or where they contain holes.
  2. Cracked joints where cracks can be penetrated at least 1/4 inch by a knife blade 0.027 inch thick.
  3. Cracked joints where cracks are 1/16 inch or more in width and of any depth.
  4. Joints where they sound hollow when tapped by metal object.
  5. Joints where they are worn back 1/4 inch or more from surface.
  6. Joints where they are deteriorated to point that mortar can be easily removed by hand, without tools.
  7. Joints where they have been filled with substances other than mortar.

- B. Do not rake out and repoint joints where not required.
- C. Rake out joints as follows, according to procedures demonstrated in approved mockup:
  - 1. Remove mortar from joints to depth of joint width plus 1/8 inch, but not less than 1/2 inch or not 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 or patch damaged masonry units as directed by Architect.
    - a. Cut out mortar by hand with chisel and resilient mallet. Do not use power-operated grinders.
    - b. Cut out center of mortar bed joints using angle grinders with diamond-impregnated metal blades. Remove remaining mortar by hand with chisel and resilient mallet.
- D. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.
- E. Pointing with Mortar:
  - 1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
  - 2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch until a uniform depth is formed. Fully compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
  - 3. After low areas have been filled to same depth as remaining joints, point all joints by placing mortar in layers not greater than 3/8 inch. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing masonry units have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed masonry surfaces or to featheredge the mortar.
  - 4. When mortar is thumbprint hard, tool joints to match original appearance of joints as demonstrated in approved mockup. Remove excess mortar from edge of joint by brushing.
  - 5. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours including weekends and holidays.
    - a. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.
  - 6. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.
- F. Where repointing work precedes cleaning of existing masonry, allow mortar to harden at least 30 days before beginning cleaning work.

### 3.9 FINAL CLEANING

- A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure.
  - 1. Do not use metal scrapers or brushes.
  - 2. Do not use acidic or alkaline cleaners.

END OF SECTION 040120

**SECTION 042200**  
**CONCRETE UNIT MASONRY**

**PART 1 - GENERAL**

**1.1 SUMMARY**

**A. Section Includes:**

1. Concrete masonry units (CMU's).

**1.2 PRECONSTRUCTION TESTING**

**A. Preconstruction Testing Service:** Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
2. Mortar Test (Property Specification): For each mix required, according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
3. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.
4. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.

**1.3 ACTION SUBMITTALS**

- A. Product Data:** For each type of product indicated.
- B. Shop Drawings:** For reinforcing steel. Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
- C. Samples:** For each type and color of exposed masonry unit and colored mortar.

**1.4 INFORMATIONAL SUBMITTALS**

- A. Material Certificates:** For each type and size of product indicated. For masonry units include data on material properties.
- B. Mix Designs:** For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

#### 1.5 QUALITY ASSURANCE

- A. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
- B. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.
  1. Build sample panels for typical exterior and interior walls in sizes approximately 48 inches long by 36 inches high by full thickness].

#### 1.6 PROJECT CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

### PART 2 - PRODUCTS

#### 2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.
- B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

#### 2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

- B. Integral Water Repellent: Provide units made with liquid polymeric, integral water repellent admixture that does not reduce flexural bond strength for exposed units.
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. [ACM Chemistries, Inc.](#); RainBloc.
    - b. [BASF Aktiengesellschaft](#); Rheopel Plus.
    - c. [Grace Construction Products, W. R. Grace & Co.](#) - Conn.; Dry-Block.
- C. CMUs: ASTM C 90.
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi.
  2. Density Classification: Normal weight, Type I.
- D. Pre-faced CMUs: Lightweight hollow concrete units complying with ASTM C 90, with manufacturer's standard smooth resinous facing complying with ASTM C 744.
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi.
  2. Size: Manufactured with pre-faced surfaces having 1/16-inch-wide returns of facing to create 1/4-inch-wide mortar joints.
  3. Colors and Patterns: As selected by Architect from manufacturer's full range.

### 2.3 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Grout: ASTM C 476, 2000 psi.
- E. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
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. [Euclid Chemical Company \(The\)](#); Accelguard 80.
    - b. [Grace Construction Products, W. R. Grace & Co.](#) - Conn.; Morset.
    - c. [Sonneborn Products, BASF Aktiengesellschaft](#); Trimix-NCA.

- F. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs, containing integral water repellent by same manufacturer.
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. ACM Chemistries, Inc.; RainBloc for Mortar.
    - b. BASF Aktiengesellschaft; Rheopel Mortar Admixture.
    - c. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.
- G. Water: Potable.

## 2.4 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.
- B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
1. Interior Walls: Mill-galvanized, carbon steel.
  2. Exterior Walls: Hot-dip galvanized, carbon steel.
  3. Wire Size for Side Rods: 0.148-inch diameter.
  4. Wire Size for Cross Rods: 0.148-inch diameter.
  5. Wire Size for Veneer Ties: 0.148-inch diameter.
  6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
  7. Provide in lengths of not less than 10 feet.

## 2.5 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
  2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
  3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.060-inch-thick, steel sheet, galvanized after fabrication.
  2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.187-inch-diameter, hot-dip galvanized steel wire.
  3. Corrugated Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from 0.060-

inch-thick, steel sheet, galvanized after fabrication with dovetail tabs for inserting into dovetail slots in concrete and sized to extend to within 1 inch (25 mm) of masonry face.

- C. Partition Top anchors: 0.105-inch-thick metal plate with 3/8-inch-diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- D. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.
  - 1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.
- E. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

## 2.6 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with Section 076200 "Sheet Metal Flashing and Trim and as follows:
  - 1. Metal Drip Edge: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
  - 2. Metal Sealant Stop: Fabricate from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
- B. Flexible Flashing: Use one of the following unless otherwise indicated:
  - 1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.030 inch.
    - a. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) [Advanced Building Products Inc.](#); Peel-N-Seal.
      - 2) [Carlisle Coatings & Waterproofing](#); CCW-705-TWF Thru-Wall Flashing.
      - 3) [Dayton Superior Corporation, Dur-O-Wal Division](#); Dur-O-Barrier Thru-Wall Flashing.
      - 4) [Fiberweb, Clark Hammerbeam Corp.](#); Aquaflash 500.
      - 5) [Grace Construction Products, W. R. Grace & Co.](#) - Conn.; Perm-A-Barrier Wall Flashing.
      - 6) [Heckmann Building Products Inc.](#); No. 82 Rubberized-Asphalt Thru-Wall Flashing.
      - 7) [Hohmann & Barnard, Inc.](#); Textroflash.
      - 8) [W. R. Meadows, Inc.](#); Air-Shield Thru-Wall Flashing.
      - 9) [Polyguard Products, Inc.](#); Polyguard 300 or Polyguard 400.
      - 10) [Sandell Manufacturing Co., Inc.](#); Sando-Seal.



- 11) [Williams Products, Inc.](#); Everlastic MF-40.
  2. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy.
    - a. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) [DuPont](#); Thru-Wall Flashing.
      - 2) [Hohmann & Barnard, Inc.](#); Flex-Flash.
      - 3) [Hyload, Inc.](#); Hyload Cloaked Flashing System.
      - 4) [Mortar Net USA, Ltd.](#); Total Flash.
  3. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D 4637, 0.040 inch thick.
    - a. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) [Carlisle Coatings & Waterproofing](#); Pre-Kleened EPDM Thru-Wall Flashing.
      - 2) [Firestone Specialty Products](#); FlashGuard.
      - 3) [Heckmann Building Products Inc.](#); No. 81 EPDM Thru-Wall Flashing.
      - 4) [Hohmann & Barnard, Inc.](#); Epra-Max EPDM Thru-Wall Flashing.
      - 5) [Sandell Manufacturing Co., Inc.](#); EPDM Flashing.
  - 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. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      - a. [Mortar Net USA, Ltd.](#); Blok-Flash.
  - D. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 "Sheet Metal Flashing and Trim."
  - E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.
- 2.7 MISCELLANEOUS MASONRY ACCESSORIES
- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; formulated from neoprene.

- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

## 2.8 MASONRY-CELL INSULATION

- A. Loose-Granular Fill Insulation: Perlite complying with ASTM C 549, Type II (surface treated for water repellency and limited moisture absorption) or Type IV (surface treated for water repellency and to limit dust generation).
- B. Molded-Polystyrene Insulation Units: Rigid, cellular thermal insulation formed by the expansion of polystyrene-resin beads or granules in a closed mold to comply with ASTM C 578, Type I. Provide specially shaped units designed for installing in cores of masonry units.
  - 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. [Concrete Block Insulating Systems](#); Korfil.
    - b. [Shelter Enterprises Inc.](#); Omni Core.

## 2.9 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
  - 1. Do not use calcium chloride in mortar or grout.
  - 2. Use portland cement-lime mortar unless otherwise indicated.
  - 3. For exterior masonry, use portland cement-lime mortar.
  - 4. For reinforced masonry, use portland cement-lime mortar.
  - 5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
  - 1. For masonry below grade or in contact with earth, use Type M or Type S.
  - 2. For reinforced masonry, use Type N.
  - 3. For mortar parge coats, use Type N.

4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
- D. Grout for Unit Masonry: Comply with ASTM C 476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
  2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
  3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

## PART 3 - EXECUTION

### 3.1 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.

3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

### 3.2 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- C. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- G. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

### 3.3 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
  1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
  2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
  3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
  4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

### 3.4 MASONRY-CELL INSULATION

- A. Pour granular insulation into cavities to fill void spaces. Maintain inspection ports to show presence of insulation at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of insulation to one story high, but not more than 20 feet.
- B. Install molded-polystyrene insulation units into masonry unit cells before laying units.

### 3.5 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
  - 1. Space reinforcement not more than 16 inches o.c.
  - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
  - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

### 3.6 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:
  - 1. Provide an open space not less than 1/2 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
  - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
  - 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

### 3.7 FLASHING

- A. General: Install embedded flashing in masonry at lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
  2. At lintels, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches ends and turn up not less than 2 inches to form end dams.
  3. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
  4. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal flashing termination.
- 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.

### 3.8 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
  2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
  2. Limit height of vertical grout pours to not more than 60 inches.

### 3.9 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to

perform tests and inspections. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.

- B. Inspections: Level 1 special inspections according to the "International Building Code."
  - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
  - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
  - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- G. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

### 3.10 REPAIRING, POINTING, AND CLEANING

- A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  - 1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
  - 2. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

END OF SECTION 042200

**SECTION 054000**  
**COLD-FORMED METAL FRAMING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

**A. Section Includes:**

1. Load-bearing wall framing.

**1.2 ACTION SUBMITTALS**

**A. Product Data:** For each type of cold-formed steel framing product and accessory.

**B. Shop Drawings:**

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
3. Shop drawings for exterior wall framing to include wind load calculations signed and sealed by a structural engineer registered in the State of Pennsylvania.

**1.3 INFORMATIONAL SUBMITTALS**

**A. Qualification Data:** For testing agency.

**B. Welding certificates.**

**C. Product test reports.**

**D. Research reports.**

**1.4 QUALITY ASSURANCE**

**A. Product Tests:** Mill certificates or data from a qualified independent testing agency.

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



## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. AllSteel & Gypsum Products, Inc.
  2. California Expanded Metal Products Company.
  3. ClarkWestern Building Systems, Inc.
  4. Consolidated Fabricators Corp.; Building Products Division.
  5. Craco Mfg., Inc.
  6. Custom Stud Inc.
  7. Design Shapes in Steel.
  8. Dietrich Metal Framing; a Worthington Industries company.
  9. Formetal Co. Inc. (The).
  10. MarinoWARE.
  11. MBA Building Supplies, Inc.
  12. Nuconsteel; a Nucor Company.
  13. Olmar Supply, Inc.
  14. Quail Run Building Materials, Inc.
  15. SCAFCO Corporation.
  16. Southeastern Stud & Components, Inc.
  17. State Building Products, Inc.
  18. Steel Construction Systems.
  19. Steel Network, Inc. (The).
  20. Steel Structural Systems.
  21. Steeler, Inc.
  22. Super Stud Building Products, Inc.
  23. Telling Industries, LLC.
  24. United Metal Products, Inc.
  25. United Steel Manufacturing.

### 2.2 PERFORMANCE REQUIREMENTS

- A. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.

### 2.3 COLD-FORMED STEEL FRAMING, GENERAL

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
1. Grade: As required by structural performance.
  2. Coating: G60.

- B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
  - 1. Grade: As required by structural performance.
  - 2. Coating: G60.

#### 2.4 LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
  - 1. Minimum Base-Metal Thickness: 0.0329 inch.
  - 2. Flange Width: 1-3/8 inches.
  - 3. Section Properties: None specified.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and matching minimum base-metal thickness of steel studs.
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:
  - 1. Minimum Base-Metal Thickness: 0.0428 inch.
  - 2. Flange Width: 1-5/8 inches.
  - 3. Section Properties: None specified.

#### 2.5 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration.

#### 2.6 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.

- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
  - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

## 2.7 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.
- D. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.
- B. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

### 3.2 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.

- C. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
- D. Install framing members in one-piece lengths.
- E. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- F. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- G. Install insulation, specified in Section 072100 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- H. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- I. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
  - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

### 3.3 LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
  - 1. Anchor Spacing: 24 inches.
- B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
  - 1. Stud Spacing: 16 inches.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
- D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.
- E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.

- F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.
- G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
  - 1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
  - 2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.
- H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
  - 1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
- I. Install horizontal bridging in stud system, spaced vertically 48 inches. Fasten at each stud intersection.
  - 1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.
  - 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
  - 3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.
- K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.
- L. Wire tying of framing components is not permitted.

### 3.4 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.

- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### 3.5 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

**SECTION 057000**  
**DECORATIVE METAL**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
1. Perforated metal screening.

**1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated, including finishing materials.
- B. Shop Drawings: Show fabrication and installation details. Indicate materials, finishes, fasteners, anchorages, and accessory items.
- C. Patterns, Models, or Plaster Castings: For each custom casting required.
- D. Samples: For each type of exposed finish required.

**PART 2 - PRODUCTS**

**2.1 STEEL**

- A. Bars: Hot-rolled, carbon steel complying with ASTM A 29/A 29M, Grade 1010.
- B. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Sheet, Cold Rolled: ASTM A 1008/A 1008M, either commercial steel or structural steel, exposed.

**2.2 FASTENERS**

- A. Fastener Materials: Unless otherwise indicated, provide the following:
1. Steel Items: Plated steel fasteners with ASTM B 633, Class Fe/Zn 25 electrodeposited zinc coating unless otherwise indicated.
  2. Dissimilar Metals: Stainless-steel fasteners.

- B. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.

## 2.3 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Low-Emitting Paints and Coatings: Paints and coatings applied to interior decorative metal items shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting".
- D. Universal Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

## 2.4 FABRICATION, GENERAL

- A. Form decorative metal to required shapes and sizes, true to line and level with true curves and accurate angles and surfaces. Finish exposed surfaces to smooth, sharp, well-defined lines and arris.
- B. Mill joints to a tight, hairline fit. Cope or miter corner joints. Fabricate connections that will be exposed to weather in a manner to exclude water.
- C. Comply with AWS for recommended practices in shop welding. Weld behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded joints of flux, and dress exposed and contact surfaces.
  - 1. Where welding cannot be concealed behind finished surfaces, finish joints to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 2 Welds: completely sanded joint, some undercutting and pinholes okay
- D. Provide castings that are sound and free of warp, cracks, blowholes, or other defects that impair strength or appearance. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks.

## 2.5 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.



## 2.6 STEEL AND IRON FINISHES

- A. Preparing Nongalvanized Items for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- B. Primer Application: Apply shop primer to prepared surfaces of items unless otherwise indicated. Primer need not be applied to surfaces to be embedded in concrete or masonry.
  - 1. Shop prime uncoated ferrous-metal surfaces with primers specified in Section 099113 "Exterior Painting" unless indicated.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Provide anchorage devices and fasteners where needed to secure decorative metal to in-place construction.
- B. Set products accurately in location, alignment, and elevation, measured from established lines and levels.
- C. Fit exposed connections accurately together to form tight, hairline joints or, where indicated, uniform reveals and spaces for sealants and joint fillers.
- D. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.
- E. Restore protective coverings that have been damaged during shipment or installation. Remove protective coverings only when there is no possibility of damage from other work.

END OF SECTION 057000

## SECTION 057300

### DECORATIVE METAL RAILINGS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Aluminum or stainless steel decorative rooftop security railings with aluminum or stainless-steel, wire-rope or welded wire mesh guard infill.

##### 1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated. Engineer must be licensed / registered in State of Pennsylvania.

B. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

###### 1. Handrails and Top Rails of Guards:

- a. Uniform load of 50 lbf/ft. applied in any direction.
- b. Concentrated load of 200 lbf applied in any direction.
- c. Uniform and concentrated loads need not be assumed to act concurrently.

###### 2. Infill of Guards:

- a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
- b. Infill load and other loads need not be assumed to act concurrently.

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

##### 1.3 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on laboratory mockups.

1. Build laboratory mockups at testing agency facility; use personnel, materials, and methods of construction that will be used at Project site.
2. Test railings according to ASTM E 894 and ASTM E 935.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
  - 1. Manufacturer's product lines of railings assembled from standard components.
  - 2. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required.
- D. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data and calculations signed and sealed by the qualified professional engineer responsible for their preparation. Engineer must be licensed / registered in State of Pennsylvania.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.
- C. Preconstruction test reports.

#### 1.6 QUALITY ASSURANCE

- A. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval.
- B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
  - 1. Build mockups for each form and finish of railing consisting of two posts, top rail, infill area, and anchorage system components.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. [Steel and Iron Decorative Railings:](#)
  - b. [Architectural Iron Designs, Inc.](#)

- c. [Artezzi.](#)
- d. [Bavarian Iron Works Co.; TT Triebenbacher.](#)
- e. [Blum, Julius & Co., Inc.](#)
- f. [Braun, J. G., Company; a division of the Wagner Companies.](#)
- g. [Indital USA; a division of Ind.i.a. SPA.](#)
- h. [Lawler Foundry Corporation.](#)
- i. [Livers Bronze Co.](#)
- j. [Olin Wrought Iron.](#)
- k. [Regency Railings.](#)
- l. [Wagner, R & B, Inc.; a division of the Wagner Companies.](#)
- m. [Wiemann Ironworks.](#)

## 2.2 METALS, GENERAL

- A. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.

## 2.3 FASTENERS

- A. Fastener Materials: Unless otherwise indicated, provide the following:
  - 1. Aluminum Components: Type 316 stainless-steel fasteners.
  - 2. Stainless-Steel Components: Type 316 stainless-steel fasteners.
- B. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
- C. Post-Installed Anchors: Torque-controlled expansion anchors.

## 2.4 MISCELLANEOUS MATERIALS

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

## 2.5 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage.
- B. Connections: Fabricate railings with welded connections unless otherwise indicated.
- C. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint.
- D. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings.
- E. Form changes in direction by inserting prefabricated elbow fittings.
- F. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- G. Close exposed ends of hollow railing members with prefabricated end fittings.
- H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
- I. Welded-Wire Mesh Infill Panels: Fabricate infill panels from stainless-steel bars.
  1. Edge panels with U-shaped channels made from same metal as infill; not less than 0.043 inch thick.
- J. Perforated-Metal Infill Panels: Fabricate infill panels from perforated metal made from same metal as railings in which they are installed.
  1. Edge panels with U-shaped channels made from metal sheet, of same metal as perforated metal and not less than 0.043 inch thick.

## 2.6 ALUMINUM FINISHES

- A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
  1. Color: As selected by Architect from full range of industry colors and color densities.

## 2.7 STAINLESS-STEEL FINISHES

- A. Satin, Reflective, Directional Polish: No. 7.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
  1. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
  2. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

- B. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- C. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with grout.
- D. Form or core-drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with grout.
- E. Anchor posts to metal surfaces as indicated using fittings designed and engineered for this purpose.
- F. Anchor railing ends to concrete and masonry with flanges connected to railing ends and anchored to wall construction with anchors and bolts.
- G. Secure wall brackets and railing end flanges to building construction as follows:
  - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
  - 2. For hollow masonry anchorage, use toggle bolts.
- H. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

END OF SECTION 057300

**SECTION 061000**  
**ROUGH CARPENTRY**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
1. Rooftop equipment bases and support curbs.
  2. Wood blocking, cants, and nailers.
  3. Plywood backing panels.

**1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of process and factory-fabricated product.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements

**1.3 INFORMATIONAL SUBMITTALS**

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- B. Evaluation Reports: For the following, from ICC-ES:
1. Wood-preservative-treated wood.
  2. Power-driven fasteners.
  3. Power-actuated fasteners.
  4. Expansion anchors.
  5. Metal framing anchors.

**PART 2 - PRODUCTS**

**2.1 WOOD PRODUCTS, GENERAL**

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.

2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
  3. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness unless otherwise indicated.
- C. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

## 2.2 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
  2. Nailers.
  3. Rooftop equipment bases and support curbs.
  4. Cants.
- B. For items of dimension lumber size, provide Standard, Stud, or No. 3 grade lumber of any species.
- C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
1. Mixed southern pine; No. 3 grade; SPIB.
  2. Eastern softwoods; No. 3 Common grade; NeLMA.
  3. Northern species; No. 3 Common grade; NLGA.
  4. Western woods; Standard or No. 3 Common grade; WCLIB or WWPA.

## 2.3 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, in thickness indicated or, if not indicated, not less than 1/2-inch thickness.



## 2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
  - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Power-Driven Fasteners: NES NER-272.
- C. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

## 2.5 METAL FRAMING ANCHORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. [Cleveland Steel Specialty Co.](#)
  - 2. [KC Metals Products, Inc.](#)
  - 3. [Phoenix Metal Products, Inc.](#)
  - 4. [Simpson Strong-Tie Co., Inc.](#)
  - 5. [USP Structural Connectors.](#)
- B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
  - 1. Use for interior locations unless otherwise indicated.
- D. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
  - 1. Use for wood-preservative-treated lumber and where indicated.

## 2.6 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.

- B. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.
- C. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Comply with AWWA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- F. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- G. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. NES NER-272 for power-driven fasteners.
  - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

### 3.2 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

## **SECTION 061600**

### **SHEATHING**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

###### **A. Section Includes:**

1. Roof sheathing.

##### **1.2 ACTION SUBMITTALS**

###### **A. Product Data:** For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements.

##### **1.3 INFORMATIONAL SUBMITTALS**

###### **A. Evaluation Reports:** For following products, from ICC-ES:

1. Preservative-treated plywood.

#### **PART 2 - PRODUCTS**

##### **2.1 WOOD PANEL PRODUCTS**

###### **A. Plywood:** DOC PS 1.

##### **2.2 PRESERVATIVE-TREATED PLYWOOD**

###### **A. Preservative Treatment by Pressure Process:** AWPA U1; Use Category UC3b for exterior construction.

###### **B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.**

###### **C. Application:** Treat all plywood unless otherwise indicated.

## 2.3 ROOF SHEATHING

- A. Plywood Roof Sheathing: Exterior, Structural I sheathing.

## 2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
  - 1. For roof sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M

## 2.5 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Framing: Formulation complying with ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
  - 1. NES NER-272 for power-driven fasteners.
  - 2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
  - 3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two-Family Dwellings."
- D. Coordinate roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

### 3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
  - 1. Roof Sheathing:
    - a. Nail to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
    - b. Screw to cold-formed metal framing.
    - c. Space panels 1/8 inch apart at edges and ends.

END OF SECTION 061600

## SECTION 061753

### SHOP-FABRICATED WOOD TRUSSES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Wood roof trusses.
2. Wood truss bracing.
3. Metal truss accessories.

###### B. Allowances: Provide wood truss bracing under the Metal-Plate-Connected Truss Bracing Allowance as specified in Section 012100 "Allowances."

##### 1.2 ACTION SUBMITTALS

###### A. Product Data: For metal-plate connectors, metal truss accessories, and fasteners.

###### B. Shop Drawings: Show fabrication and installation details for trusses.

1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
2. Indicate sizes, stress grades, and species of lumber.
3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
4. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
5. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
6. Show splice details and bearing details.

###### C. Delegated-Design Submittal: For metal-plate-connected wood trusses indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

##### 1.3 INFORMATIONAL SUBMITTALS

###### A. Product certificates.

###### B. Evaluation Reports: For the following, from ICC-ES:

1. Metal-plate connectors.
2. Metal truss accessories.

#### 1.4 QUALITY ASSURANCE

- A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.
  - 1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
  - 2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Handle and store trusses to comply with recommendations in TPI BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal-plate-connected wood trusses.
- B. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.

#### 2.2 DIMENSION LUMBER

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  - 1. Provide dry lumber with 19 percent maximum moisture content at time of dressing.
- B. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Section 061000 "Rough Carpentry."

#### 2.3 METAL CONNECTOR PLATES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Alpine Engineered Products, Inc.; an ITW company.
  - 2. Cherokee Metal Products, Inc.; Masengill Machinery Company.

3. [CompuTrus, Inc.](#)
4. [Eagle Metal Products.](#)
5. [Jager Building Systems, Inc.; a Tembec/SGF Rexfor company.](#)
6. [MiTek Industries, Inc.; a subsidiary of Berkshire Hathaway Inc.](#)
7. [Robbins Engineering, Inc.](#)
8. [Truswal Systems Corporation; an ITW company.](#)

- B. General: Fabricate connector plates to comply with TPI 1.
- C. Hot-Dip Galvanized-Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 coating designation; and not less than 0.036 inch thick.

## 2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
  2. Where trusses are exposed to weather, in ground contact, made from pressure-preservative treated wood, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.

## 2.5 METAL FRAMING ANCHORS AND ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. **Basis-of-Design Product:** Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. [Cleveland Steel Specialty Co.](#)
  2. [KC Metals Products, Inc.](#)
  3. [Phoenix Metal Products, Inc.](#)
  4. [Simpson Strong-Tie Co., Inc.](#)
  5. [USP Structural Connectors.](#)
- C. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- D. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.



## 2.6 FABRICATION

- A. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
  - 1. Fabricate wood trusses within manufacturing tolerances in TPI 1.
- B. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install wood trusses only after supporting construction is in place and is braced and secured.
- B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.
- C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
- D. Install and brace trusses according to TPI recommendations and as indicated.
- E. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.
- F. Securely connect each truss ply required for forming built-up girder trusses.
- G. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
  - 1. Install bracing to comply with Section 061000 "Rough Carpentry."
  - 2. Install and fasten strongback bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.
- H. Install wood trusses within installation tolerances in TPI 1.
- I. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.
- J. Replace wood trusses that are damaged or do not meet requirements.

END OF SECTION 061753

**SECTION 062023**  
**INTERIOR FINISH CARPENTRY**

**PART 1 - GENERAL**

**1.1 SUMMARY**

**A. Section Includes:**

1. Interior trim, including window sills.
2. Shelving.

**B. Related Requirements:**

1. Section 064023 "Interior Architectural Woodwork" for shop-fabricated interior  
woodwork.

**1.2 ACTION SUBMITTALS**

- A. Product Data:** For each type of process and factory-fabricated product.

**PART 2 - PRODUCTS**

**2.1 MATERIALS, GENERAL**

**A. Hardwood Lumber:**

1. Factory mark each piece of lumber with grade stamp of inspection agency indicating  
grade, species, moisture content at time of surfacing, and mill.
  - a. For exposed lumber, mark grade stamp on end or back of each piece.
  - b. Species and grade: Solid hard maple , AWI grading rules; Custom Grade.

**2.2 INTERIOR TRIM**

**A. Hardwood Lumber Trim:**

1. Species and Grade: Solid hard maple species, AWI grading rules; Custom Grade.
2. Maximum Moisture Content: 13 percent.

## 2.3 SHELVING

- A. Shelving: Made from the following material, 3/4 inch (19 mm) thick.
  - 1. Hardwood Boards: Solid hard maple species, AWI grading rules; Custom Grade.; kiln dried.
- B. Shelf Brackets: BHMA A156.16; stainless steel.
- C. Misc. Cabinet Hardware: BHMA A156.16; stainless steel.

## 2.4 WINDOW SILLS

- A. Sills: Made from the following material, 3/4 inch (19 mm) thick.
  - 1. Hardwood Boards: Solid hard maple species, AWI grading rules; Custom Grade.; kiln dried. Profile: Square. Finish: Stained.

## 2.5 BULLETIN BOARD SLATS

- A. Slats: Made from the following material, 3/4 inch (19 mm) thick.
  - 1. Hardwood Boards: Solid hard maple species, AWI grading rules; Custom Grade.; kiln dried. Profile: Square. Finish: Stained.

## 2.6 MISCELLANEOUS MATERIALS

- A. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.

# PART 3 - EXECUTION

## 3.1 PREPARATION

- A. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours.

## 3.2 INSTALLATION, GENERAL

- A. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
  - 1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
  - 2. Countersink fasteners, fill surface flush, and sand unless otherwise indicated.
  - 3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.

END OF SECTION 062023

PROJECT NO. 16640E-01-02  
062023-3  
INTERIOR FINISH CARPENTRY

## SECTION 064100

### ARCHITECTURAL WOOD CASEWORK

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Fabricated architectural cabinets.
2. Fabricated architectural shelves.
3. Wood furring, blocking, shims, and hanging strips for installing architectural cabinets unless concealed within other construction before cabinet installation.

##### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product, including cabinet panel products and cabinet hardware and accessories.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
- C. Samples:
  1. Wood samples, for each color, pattern, and surface finish.

##### 1.3 INFORMATIONAL SUBMITTALS

- A. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

##### 1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Certified participant in AWI's Quality Certification Program.
- B. Installer Qualifications: Fabricator of products.

##### 1.5 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

## PART 2 - PRODUCTS

### 2.1 ARCHITECTURAL CABINET FABRICATORS

- A. Fabricators: Subject to compliance with requirements, available fabricators offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. None specified.

### 2.2 WOOD ARCHITECTURAL CABINETS AND SHELVING

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural wood cabinets indicated for construction, finishes, installation, and other requirements.
  - 1. Provide labels and certificates from AWI certification program indicating that woodwork, including installation, complies with requirements of grades specified.
- B. Grade: Custom.
- C. Type of Construction: Frameless.
- D. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.
- E. Reveal Dimension: 1/4 inch.
- F. Materials for Exposed Surfaces:
  - 1. Horizontal (Shelf) Surfaces: Solid Hard Maple.
  - 2. Vertical Surfaces: Solid Hard Maple.
  - 3. Grain Direction: Vertically for drawer fronts, doors, and fixed panels.
- G. Materials for Semiexposed Surfaces:
  - 1. Surfaces Other Than Drawer Bodies: Hardwood plywood.
  - 2. Drawer Sides and Backs: Solid-hardwood lumber.
  - 3. Drawer Bottoms: Hardwood plywood.
- H. Dust Panels: 1/4-inch plywood above compartments and drawers unless located directly under tops.
- I. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed wood surfaces complying with the following requirements:
  - 1. As selected by Architect from wood supplier's full range in the following categories:
    - a. Wood grain and stain finish.

## 2.3 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
  - 1. Wood Moisture Content: 5 to 10 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
  - 1. Veneer-Faced Panel Products (Hardwood Plywood): Maple face species, HPVA grading rules, A-1 grade; rotary cut.

## 2.4 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087111 "Door Hardware (Descriptive Specification)."
- B. Butt Hinges: 2-3/4-inch, five-knuckle steel hinges made from 0.095-inch-thick metal, and as follows:
  - 1. Semiconcealed Hinges for Flush Doors: BHMA A156.9, B01361.
  - 2. Semiconcealed Hinges for Overlay Doors: BHMA A156.9, B01521.
- C. Back-Mounted Pulls: BHMA A156.9, B02011.
- D. Wire Pulls: Back mounted, solid metal, 5 inches long, 2-1/2 inches deep, and 5/16 inch in diameter.
- E. Catches: Magnetic catches, BHMA A156.9, B03141.
- F. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
- G. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.
- H. Drawer Slides: BHMA A156.9.
  - 1. Grade 1 and Grade 2: Side mounted; full-extension type; zinc-plated steel with polymer rollers.
  - 2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
  - 3. For drawers more than 3 inches high but not more than 6 inches high and not more than 24 inches wide, provide Grade 1.
  - 4. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-100.
- I. Door Locks: BHMA A156.11, E07121.

- J. Drawer Locks: BHMA A156.11, E07041.
- K. Door and Drawer Silencers: BHMA A156.16, L03011.
- L. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
  - 1. Satin Stainless Steel: BHMA 630.

## 2.5 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde.

## 2.6 FABRICATION

- A. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- B. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
- C. Fasteners to be concealed or countersunk.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

### 3.2 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.



- C. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- D. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork.
- E. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
  - 1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
  - 2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch (38-mm) penetration into wood framing, blocking, or hanging strips.

END OF SECTION 064116

**SECTION 072100**  
**THERMAL INSULATION**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Glass-fiber blanket insulation.
  2. Vapor retarders.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Research/evaluation reports.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET INSULATION

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. CertainTeed Corporation.
  2. Guardian Building Products, Inc.
  3. Johns Manville.
  4. Knauf Insulation.
  5. Owens Corning.
- B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
- C. Kraft-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type II (non-reflective faced), Class C (faced surface not rated for flame propagation); Category 1 (membrane is a vapor barrier).

- D. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

## 2.2 VAPOR RETARDERS

- A. Polyethylene Vapor Retarders: ASTM D 4397, 6 mils thick, with maximum permeance rating of 0.13 perm.
- B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

### 3.2 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Glass-Fiber Insulation: Install in cavities formed by framing members according to the following requirements:
  - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
  - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

4. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
5. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
6. For wood-framed construction, install blankets according to ASTM C 1320 and as follows:
  - a. With faced blankets having stapling flanges, secure insulation by inset, stapling flanges to sides of framing members.
  - b. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
7. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
  - a. Exterior Walls: Set units with facing placed toward exterior of construction.
  - b. Interior Walls: Set units with facing placed toward areas of high humidity.

### 3.3 INSTALLATION OF VAPOR RETARDERS

- A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.
  1. Fasten vapor retarders to wood framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches o.c.
  2. Before installing vapor retarders, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
  3. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.
- C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.
- D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

END OF SECTION 072100

## SECTION 072500

### WEATHER BARRIERS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Building paper.
2. Building wrap.
3. Flexible flashing.

##### 1.2 ACTION SUBMITTALS

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

##### 1.3 INFORMATIONAL SUBMITTALS

###### A. Evaluation Reports: For water-resistive barrier and flexible flashing, from ICC-ES.

#### PART 2 - PRODUCTS

##### 2.1 WATER-RESISTIVE BARRIER

###### A. Building Paper: ASTM D 226, Type 1 (No. 15 asphalt-saturated organic felt), unperforated.

###### B. Building Paper: Water-vapor-permeable, asphalt-saturated kraft building paper that complies with ICC-ES AC38, Grade D.

###### C. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.

###### 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. Dow Chemical Company (The); Styrofoam Weathermate Plus Brand Housewrap.
- b. DuPont (E. I. du Pont de Nemours and Company); Tyvek CommercialWrap, HomeWrap, HeaderWrap, and HeaderWrap.
- c. Ludlow Coated Products; Air Stop Housewrap, Barricade Building Wrap, EnergyWrap Housewrap or R-Wrap Protective House Wrap.
- d. Pactiv, Inc.; GreenGuard Classic Wrap, RainDrop, Ultra Wrap or Value Wrap.

- e. [Raven Industries Inc.; Fortress Pro Weather Protective Barrier.](#)
  - f. [Reemay, Inc.; Typar HouseWrap.](#)
2. Water-Vapor Permeance: Not less than 50 g through 1 sq. m of surface in 24 hours per ASTM E 96/E 96M, Desiccant Method (Procedure A).
- D. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

## 2.2 MISCELLANEOUS MATERIALS

- A. Flexible Flashing: Self-adhesive butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.
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. [DuPont \(E. I. du Pont de Nemours and Company\); DuPont Flashing Tape.](#)
  - b. [Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Vycor Butyl Self Adhered Flashing.](#)
  - c. [Protecto Wrap Company; BT-25 XL.](#)
  - d. [Raven Industries Inc.; Fortress Flashshield.](#)
  - e. [Advanced Building Products Inc.; Wind-o-wrap.](#)
  - f. [Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.](#)
  - g. [Fiberweb, Clark Hammerbeam Corp.; Aquaflash 500.](#)
  - h. [Fortifiber Building Systems Group; Fortiflash 25 or Fortiflash 40.](#)
  - i. [Grace Construction Products, a unit of W. R. Grace & Co. - Conn.;](#) Vycor Plus Self-Adhered Flashing and Vycor V40 Self-Adhered Flashing.
  - j. [MFM Building Products Corp.; Window Wrap.](#)
  - k. [Polyguard Products, Inc.;](#) Polyguard JT-20 Tape or Polyguard JT-30 Tape.
  - l. [Sandell Manufacturing Co., Inc.; Presto-Seal.](#)

## PART 3 - EXECUTION

### 3.1 WATER-RESISTIVE BARRIER INSTALLATION

- A. Cover sheathing with water-resistive barrier as follows:
- 1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
  - 2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.
- B. Building Paper: Apply horizontally with a 2-inch overlap and a 6-inch end lap; fasten to sheathing with galvanized staples or roofing nails.

C. Building Wrap: Comply with manufacturer's written instructions.

1. Seal seams, edges, fasteners, and penetrations with tape.
2. Extend into jambs of openings and seal corners with tape.

### 3.2 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.

1. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
2. Lap flashing over water-resistive barrier at bottom and sides of openings.
3. Lap water-resistive barrier over flashing at heads of openings.

END OF SECTION 072500

## SECTION 075216

### STYRENE-BUTADIENE-STYRENE

#### (SBS) MODIFIED BITUMINOUS MEMBRANE ROOFING

##### PART 1 - GENERAL

###### 1.1 SUMMARY

- A. Section includes styrene-butadiene-styrene (SBS) modified bituminous membrane roofing.

###### 1.2 DEFINITIONS

- A. Hot Roofing Asphalt: Roofing asphalt heated to its equiviscous temperature, the temperature at which its viscosity is 125 centipoise for mop-applied roofing asphalt and 75 centipoise for mechanical spreader-applied roofing asphalt, within a range of plus or minus 25 deg F measured at the mop cart or mechanical spreader immediately before application.

###### 1.3 PERFORMANCE REQUIREMENTS

- A. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.
  - 1. Corner Uplift Pressure: 195 lbf/sq. ft.
  - 2. Perimeter Uplift Pressure: 150 lbf/sq. ft.
  - 3. Field-of-Roof Uplift Pressure: 120 lbf/sq. ft.
- B. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.
- C. Energy Performance: Provide roofing system that is listed on DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.
- D. Energy Performance: Provide roofing system with initial Solar Reflectance not less than 0.70 and Thermal Emittance not less than 0.75 when tested according to Cool Roof Rating Council's CRRC-1.

###### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

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- C. Samples for Verification: For membrane cap sheet, of color specified.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Research/evaluation reports.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance data.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.
- B. Source Limitations: Obtain components for membrane roofing system from same manufacturer as membrane roofing.
- C. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency.
- D. Preinstallation Roofing Conference: Conduct conference at Project site.
- E. Field Services: Manufacturer's representative to provide field services – four (4) field visits – representative to attend commencement of installation of roofing materials and insulation materials, one progress visit, and inspect completed installation. Manufacturer's representative to provide field reports for each visit.
- F. Verification of Completed Work: General Contractor to provide Infrared survey of completed roof system confirming that there are no subsurface moisture conditions.

#### 1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.
  - 1. System Warranty Period: 20 years from date of Substantial Completion.
  - 2. Installer Warranty Period: 2 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 SBS-MODIFIED ASPHALT-SHEET MATERIALS

#### A. SBS-Modified Bituminous Membrane Roofing:

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
  - a. [Firestone Building Products.](#)
  - b. [GAF Materials Corporation.](#)
  - c. [Johns Manville.](#)

#### B. Granule-Surface Roofing Membrane Cap Sheet: ASTM D 6163, Grade G, Type I or II, SBS-modified asphalt sheet (reinforced with glass fibers); granular surfaced; suitable for application method specified, and as follows:

1. Granule Color: Gray.

### 2.2 BASE-SHEET MATERIALS

#### A. Sheathing Paper: Red-rosin type, minimum 3 lb/100 sq. ft.

#### B. Base Sheet: ASTM D 4897, Type II, venting, nonperforated, heavyweight, asphalt-impregnated and -coated, glass-fiber base sheet with coarse granular surfacing or embossed venting channels on bottom surface.

### 2.3 BASE-PLY SHEET MATERIALS

#### A. Glass-Fiber Base-Ply Sheet: ASTM D 2178, Type IV, asphalt-impregnated, glass-fiber felt.

### 2.4 BASE FLASHING SHEET MATERIALS

#### A. Backer Sheet: ASTM D 6163, Grade S, Type I or II, SBS-modified asphalt sheet (reinforced with glass fibers); smooth surfaced; suitable for application method specified.

#### B. Granule-Surfaced Flashing Sheet: ASTM D 6163, Grade G, Type I or II, SBS-modified asphalt sheet (reinforced with glass fibers); granular surfaced; suitable for application method specified, and as follows:

1. Granule Color: Gray.

### 2.5 AUXILIARY ROOFING MEMBRANE MATERIALS

#### A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.

- B. Asphalt Primer: ASTM D 41.
- C. Roofing Asphalt: ASTM D 312, Type III or IV as recommended by roofing system manufacturer for application.
- D. Cold-Applied Adhesive: Roofing system manufacturer's standard asphalt-based, one- or two-part, asbestos-free, cold-applied adhesive specially formulated for compatibility and use with roofing membrane and base flashings.
- E. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required by roofing system manufacturer for application.
- F. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing membrane components to substrate; tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.

## 2.6 SUBSTRATE BOARDS

- A. Substrate Board: ASTM C 1278/C 1278M, cellulosic-fiber-reinforced, water-resistant gypsum substrate, 5/8 inch thick.
  - 1. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. **USG Corporation;** Securock.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

## 2.7 ROOF INSULATION

- A. Composite Polyisocyanurate Board Insulation: ASTM C 1289, with factory-applied facing board, as indicated below by type, on one major surface and felt or glass-fiber mat facer on the other surface.
  - 1. Type IV, cellulosic-fiber-insulating-board facer, Grade 2, 1/2 inch thick.
- B. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches unless otherwise indicated.
- C. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

## 2.8 INSULATION ACCESSORIES

- A. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.
- B. Cold-Applied Adhesive: Insulation manufacturer's recommended cold-applied adhesive formulated to attach roof insulation to substrate or to another insulation layer.
- C. Insulation Cant Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.
- D. Wood Nailer Strips: Comply with requirements in Section 061000 "Rough Carpentry."
- E. Tapered Edge Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.
- F. Cover Board: ASTM C 1278/C 1278M, cellulosic-fiber-reinforced, water-resistant gypsum substrate, 1/2 inch thick.
  - 1. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. **USG Corporation;** Securock.

## 2.9 WALKWAYS

- A. Walkway Pads: Reinforced asphaltic composition pads with slip-resisting mineral-granule surface, manufactured as a traffic pad for foot traffic and acceptable to roofing system manufacturer, 3/8 inch thick, minimum.
  - 1. Pad Size: 24 by 24 inches.

## PART 3 - EXECUTION

### 3.1 SUBSTRATE BOARD INSTALLATION

- A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
  - 1. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to membrane roofing system manufacturers' written instructions.

### 3.2 INSULATION INSTALLATION

- A. Comply with roofing system manufacturer's written instructions for installing roof insulation.

- B. Nailer Strips: Mechanically fasten 4-inch nominal-width wood nailer strips of same thickness as insulation perpendicular to sloped roof deck at the following spacing:
  - 1. 16 feet apart for roof slopes steeper than 1 inch per 12 inches but less than 3 inches per 12 inches.
  - 2. 48 inches for roof slopes steeper than 3 inches per 12 inches.
- C. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing membrane system with vertical surfaces or angle changes more than 45 degrees.
- D. Install tapered insulation under area of roofing to conform to slopes indicated.
- E. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or more, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
- F. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
- G. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:
  - 1. Prime surface of concrete deck with asphalt primer at rate of 3/4 gal./100 sq. ft. and allow primer to dry.
  - 2. Set each layer of insulation in a solid mopping of hot roofing asphalt.
  - 3. Set each layer of insulation in cold-applied insulation adhesive.
- H. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
- I. Mechanically Fastened and Adhered Insulation: Install first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
  - 1. Set each subsequent layer of insulation in a solid mopping of hot roofing asphalt.
  - 2. Set each subsequent layer of insulation in cold-applied insulation adhesive.
- J. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints a minimum of 6 inches in each direction from joints of insulation below. Loosely butt cover boards together and fasten to roof deck.

### 3.3 ROOFING MEMBRANE INSTALLATION, GENERAL

- A. Install roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing" and as follows:
  - 1. Deck Type: N (nailable).
  - 2. Adhering Method: T (torched).
  - 3. Base Sheet: One.

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4. Number of Glass-Fiber Base-Ply Sheets: One.
  5. Number of SBS-Modified Asphalt Sheets: Two.
  6. Surfacing Type: M (mineral-granule-surfaced cap sheet).
- B. Where roof slope exceeds 3/4 inch per 12 inches, install roofing membrane sheets parallel with slope.
1. Backnail roofing membrane sheets to substrate according to roofing system manufacturer's written instructions.
- C. Coordinate installation of roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
- D. Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

### 3.4 BASE-SHEET INSTALLATION

- A. Loosely lay one course of sheathing paper, lapping edges and ends a minimum of 2 inches and 6 inches, respectively.
- B. Install lapped base-sheet course, extending sheet over and terminating beyond cants. Attach base sheet as follows:
1. Mechanically fasten to substrate.
  2. Spot- or strip-mop to substrate with hot roofing asphalt.
  3. Adhere to substrate in a solid mopping of hot roofing asphalt.

### 3.5 BASE-PLY SHEET INSTALLATION

- A. Install glass-fiber base-ply sheets according to roofing system manufacturer's written instructions starting at low point of roofing system. Align glass-fiber base-ply sheets without stretching. Extend sheets over and terminate beyond cants.
1. Embed glass-fiber base-ply sheet in a continuous void-free mopping of hot roofing asphalt to form a uniform membrane without glass-fiber base-ply sheets touching.

### 3.6 SBS-MODIFIED BITUMINOUS MEMBRANE INSTALLATION

- A. Install modified bituminous roofing membrane sheet and cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants.
- B. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.

1. Repair tears and voids in laps and lapped seams not completely sealed.
  2. Apply roofing granules to cover exuded bead at laps while bead is hot.
- C. Install roofing membrane sheets so side and end laps shed water.

### 3.7 FLASHING AND STRIPPING INSTALLATION

- A. Install base flashing over cant strips and other sloped and vertical surfaces, at roof edges, and at penetrations through roof; secure to substrates according to roofing system manufacturer's written instructions.
- B. Extend base flashing up walls or parapets a minimum of 8 inches above roofing membrane and 4 inches onto field of roofing membrane.
- C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
- D. Install roofing membrane cap-sheet stripping where metal flanges and edgings are set on membrane roofing according to roofing system manufacturer's written instructions.

### 3.8 WALKWAY INSTALLATION

- A. Walkway Pads: Install walkway pads using units of size indicated or, if not indicated, of manufacturer's standard size according to walkway pad manufacturer's written instructions.
  1. Set walkway pads in cold-applied adhesive.
  2. Set walkway pads in additional pour coat of hot roofing asphalt after aggregate surfacing of modified bituminous roofing membrane.

END OF SECTION 075216

**SECTION 076100**  
**SHEET METAL ROOFING**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes custom-fabricated, standing-seam sheet metal roofing.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For sheet metal roofing.
  - 1. Show installation layouts, expansion joint locations, fixed points, and keyed details. Distinguish between shop- and field-assembled work.
  - 2. Include pattern of seams and details of termination points, expansion joints, direction of expansion, roof penetrations, edge conditions, special conditions, and connections to adjoining work.
- C. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.6 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals to demonstrate aesthetic effects and to set quality standards for fabrication and installation.



1. Build mockup of typical roof area and eave as shown on Drawings, including underlayment, attachments, and accessories.
  - a. Size: Approximately 12 feet long by 6 feet.

## 1.7 WARRANTY

- A. Special Warranty: Warranty in which Installer agrees to repair or replace components of sheet metal roofing that fail in materials or workmanship within specified warranty period.
  1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal roofing that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  1. Finish Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Sheet metal roofing system including, but not limited to, metal roof panels, cleats, anchors and fasteners, sheet metal flashing integral with sheet metal roofing, fascia panels, trim, underlayment, and accessories, shall comply with requirements without failure due to defective manufacture, fabrication, or installation, or due to other defects in construction. Sheet metal roofing shall remain watertight.
- B. Sheet Metal Roofing Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or indicated on Drawings.
- C. Solar Reflectance Index: Not less than 29 when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.
- D. Energy Performance: Provide sheet metal roofing according to one of the following when tested according to CRRC-1:
  1. Three-year, aged, solar reflectance of not less than 0.55 and emissivity of not less than 0.75.
  2. Three-year, aged, Solar Reflectance Index of not less than 64 when calculated according to ASTM E 1980.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
  1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

## 2.2 ROOFING SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
  - 1. Thickness: 0.032 inch unless otherwise indicated.
    - a. Batten Caps: 0.050 inch thick.
  - 2. Finish:
    - a. Color anodic.
  - 3. Color: As selected by Architect from manufacturer's full range.
- C. Felts: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felts.
- D. Synthetic Underlayment: Laminated or reinforced, woven polyethylene or polypropylene, synthetic roofing underlayment; bitumen free; slip resistant; suitable for high temperatures over 220 deg F and complying with physical requirements of ASTM D 226/D 226M for Type I and Type II felts.
  - 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. [Atlas Roofing Corporation](#); Summit.
    - b. [Engineered Coated Products](#); Nova-Seal II.
    - c. [Kirsch Building Products, LLC](#); Sharkskin Comp or Sharkskin Ultra.
    - d. [SDP Advanced Polymer Products Inc](#); Palisade.
- E. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
  - 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. [Carlisle Residential, a division of Carlisle Construction Materials](#); WIP 300HT.
    - b. [Grace Construction Products, a unit of W. R. Grace & Co.-Conn.](#); Grace Ice and Water Shield HT or Ultra.
    - c. [Henry Company](#); Blueskin PE200 HT.
    - d. [Kirsch Building Products, LLC](#); Sharkskin Ultra SA.
    - e. [Metal-Fab Manufacturing, LLC](#); MetShield.

- f. [Owens Corning](#); WeatherLock Specialty Tile & Metal Underlayment.
  - g. [Polyguard Products, Inc.](#); Deck Guard HT.
  - h. [Protecto Wrap Company](#); Protecto Jiffy Seal Ice & Water Guard HT.
  - i. [SDP Advanced Polymer Products Inc](#); Palisade SA-HT.
- 2. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
  - 3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.
- F. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

### 2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete roofing system and as recommended by primary sheet metal manufacturer unless otherwise indicated.
- B. Wood Battens: Lumber according to requirements for nailers for roofing in Section 061000 "Rough Carpentry".
- C. Fasteners: Wood screws, annular-threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
  - 1. General:
    - a. Exposed Fasteners: Heads matching color of sheet metal roofing using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of roofing.
    - b. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed; with hex-washer head.
    - c. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
  - 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- E. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal roofing and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

## 2.4 ACCESSORIES

- A. Sheet Metal Accessories: Provide components required for complete sheet metal roofing assembly including trim, copings, fasciae, corner units, clips, flashings, sealants, gaskets, fillers, metal closures, closure strips, and similar items. Match material and finish of sheet metal roofing unless otherwise indicated.
1. Cleats: Intermittent and continuous attachment devices for mechanically seaming into joints and formed from the following materials and thicknesses unless otherwise indicated:
    - a. Aluminum Roofing: 0.0250-inch-thick stainless steel.
  2. Expansion-Type Cleats: Cleats of a design that allows longitudinal movement of roof panels without stressing panel seams; of same material as other cleats.
  3. Backing Plates: Plates at roofing splices, fabricated from material recommended by SMACNA.
  4. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin foam or closed-cell laminated polyethylene; minimum 1-inch thick, flexible-closure strips; cut or premolded to match sheet metal roofing profile. Provide closure strips where necessary to ensure weathertight construction.
  5. Flashing and Trim: Formed from same material and with same finish as sheet metal roofing, minimum 0.018 inch.
- B. Roof Curbs: Fabricated from same material and finish as sheet metal roofing, minimum thickness matching the sheet metal roofing; with bottom of skirt profiled to match roof panel and seam profiles; with weatherproof top box and integral full-length cricket. Fabricate curb subframing of nominal 0.062-inch thick, angle-, C- or Z-shaped, galvanized-steel or stainless-steel sheet. Fabricate curb and subframing to withstand indicated loads of size and height indicated. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.
1. Insulate curbs with 1-inch thick, rigid insulation.
  2. Install wood nailers at tops of curbs.

## 2.5 FABRICATION

- A. General: Custom fabricate sheet metal roofing to comply with details shown and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions (panel width and seam height), geometry, metal thickness, and other characteristics of installation. Fabricate sheet metal roofing and accessories in shop to greatest extent possible.
1. Standing-Seam Roofing: Form standing-seam panels with finished seam height of 1 inch.
- B. Form exposed sheet metal work to fit substrates with little oil canning; free of buckling and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.

1. Form and fabricate sheets, seams, strips, cleats, valleys, ridges, edge treatments, integral flashings, and other components of metal roofing to profiles, patterns, and drainage arrangements indicated on Drawings and as required for leakproof construction.
- C. Sheet Metal Accessories: Custom fabricate flashings and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item required. Obtain field measurements for accurate fit before shop fabrication.

## PART 3 - EXECUTION

### 3.1 EXAMINATION AND PREPARATION

- A. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that tops of fasteners are flush with surface.
- B. Lay out panel arrangement and screw battens to wood sheathing before installation of sheet metal roofing.
  1. Space fasteners not more than 18 inches o.c.

### 3.2 UNDERLAYMENT INSTALLATION

- A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal roofing. Apply at locations indicated on Drawings in shingle fashion to shed water, with lapped joints of not less than 2 inches.
- B. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, according to manufacturers' written instructions, using adhesive where possible to minimize use of mechanical fasteners under sheet metal. Apply at locations indicated on Drawings.
- C. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply at locations indicated on Drawings in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.
- D. Apply slip sheet, wrinkle free, before installing sheet metal roofing and related flashing.

### 3.3 INSTALLATION, GENERAL

- A. General: Install sheet metal roofing to comply with details shown and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to installation characteristics required unless otherwise indicated on Drawings. Install fasteners, solder, protective coatings,

separators, sealants, and other miscellaneous items as required for complete roofing system and as recommended by fabricator for sheet metal roofing.

1. Install sheet metal roofing true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
  2. Anchor sheet metal roofing and other components of the Work securely in place, with provisions for thermal and structural movement.
  3. Field cutting of sheet metal roofing by torch is not permitted.
  4. Provide metal closures at rake edges, rake walls, eaves and each side of ridge caps.
  5. Flash and seal sheet metal roofing with closure strips at eaves, rakes, and perimeter of all openings. Fasten with self-tapping screws.
  6. Locate and space fastenings in uniform vertical and horizontal alignment. Predrill panels for fasteners.
  7. Install ridge caps as sheet metal roofing work proceeds.
  8. Locate roofing splices over, but not attached to, structural supports. Stagger roofing splices and end laps to avoid four-panel lap splice condition. Install backing plates at roofing splices.
  9. Lap metal flashing over sheet metal roofing to direct moisture to run over and off roofing.
- B. Thermal Movement: Rigidly fasten metal roof panels to structure at only one location for each panel. Allow remainder of panel to move freely for thermal expansion and contraction.
1. Point of Fixity: Fasten each panel along single line of fixing located at ridge.
  2. Avoid attaching accessories through roof panels in manner that inhibits thermal movement.
- C. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- D. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating, by applying self-adhering sheet underlayment to each contact surface, or by other permanent separation as recommended by sheet metal manufacturer or SMACNA.
1. Coat concealed side of uncoated-aluminum sheet metal roofing with bituminous coating where roofing contacts wood, ferrous metal, or cementitious construction.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

### 3.4 CUSTOM-FABRICATED SHEET METAL ROOFING INSTALLATION

- A. Fabricate and install work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, excessive waves, and avoidable tool marks, considering metal temper and reflectivity. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant. Fold back sheet metal to form hem on concealed side of exposed edges unless otherwise indicated.

1. Install cleats to hold sheet metal panels in position. Attach each cleat with at least two fasteners to prevent rotation.
  2. Space cleats not more than 12 inches o.c. Bend tabs over fastener head.
  3. Provide expansion-type cleats for roof panels that exceed 30 feet in length.
- B. Seal joints as required for watertight construction. For roofing with 3:12 slopes or less, use cleats at transverse seams. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- C. Rivets: Rivet joints in uncoated aluminum where necessary for strength.
- D. Standing-Seam Roofing: Attach standing-seam metal panels to substrate with double-fastened cleats spaced at 12 inches o.c. Install panels reaching from eave to ridge before moving to adjacent panels. Before panels are interlocked, apply continuous bead of sealant to top of flange of lower panel. Lock standing seams by folding over twice so cleat and panel edges are completely engaged.
1. Lock each panel to panel below with sealed transverse seam.
  2. Leave seams upright after locking at ridges and hips.

### 3.5 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for complete sheet metal roofing assembly including trim, copings, seam covers, flashings, sealants, gaskets, fillers, metal closures, closure strips, and similar items.
  2. Install accessories integral to sheet metal roofing that are specified in Section 076200 "Sheet Metal Flashing and Trim" to comply with that Section's requirements.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and install units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

### 3.6 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal roofing is installed unless otherwise indicated in manufacturer's written installation instructions.

END OF SECTION 076100

PROJECT NO. 16640E-01-02  
076100-9  
SHEET METAL ROOFING



## SECTION 076200

### SHEET METAL FLASHING AND TRIM

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Manufactured reglets with counterflashing.
2. Formed roof-drainage sheet metal fabrications.
3. Formed low-slope roof sheet metal fabrications.
4. Formed steep-slope roof sheet metal fabrications.
5. Formed wall sheet metal fabrications.

##### 1.2 PREINSTALLATION MEETINGS

- ###### A. Preinstallation Conference: Conduct conference at Project site.

##### 1.3 ACTION SUBMITTALS

- ###### A. Product Data: For each type of product.

- ###### B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Distinguish between shop- and field-assembled work.
3. Include identification of finish for each item.
4. Include pattern of seams and details of termination points, expansion joints and expansion-joint covers, direction of expansion, roof-penetration flashing, and connections to adjoining work.

- ###### C. Samples: For each exposed product and for each color and texture specified.

##### 1.4 INFORMATIONAL SUBMITTALS

- ###### A. Product certificates.

- ###### B. Product test reports.

- ###### C. Sample warranty.

## 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

## 1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
  - 1. For copings and roof edge flashings that are SPRI ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.
- B. Mockups: Build mockups to verify selections made under Sample submittals to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
  - 1. Build mockup of typical roof edge, including built-in gutter, fascia, and fascia trim, approximately 10 feet long.

## 1.7 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Finish Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
- A. SPRI Wind Design Standard: Manufacture and install roof-edge flashings tested according to SPRI ES-1. Design wind speed is as follows:

1. Basic design wind speed: 115 mph.
  2. Exposure category: B.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

## 2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.
1. Color Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
  2. Color: As selected by Architect from manufacturer's full range.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, dead soft, fully annealed; 4 (polished directional satin finish).

## 2.3 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.
- B. Synthetic Underlayment: Laminated or reinforced, woven polyethylene or polypropylene, synthetic roofing underlayment; bitumen free; slip resistant; suitable for high temperatures over 220 deg F; and complying with physical requirements of ASTM D 226/D 226M for Type I and Type II felts.
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. [Atlas Roofing Corporation](#); Summit.
    - b. [Engineered Coated Products](#); Nova-Seal II.
    - c. [Kirsch Building Products, LLC](#); Sharkskin Comp or Sharkskin Ultra.
    - d. [SDP Advanced Polymer Products Inc](#); Palisade.
- C. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.

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. [Carlisle Residential, a division of Carlisle Construction Materials](#); WIP 300HT.
    - b. [Grace Construction Products, a unit of W. R. Grace & Co.-Conn.](#); Grace Ice and Water Shield HT or Ultra.
    - c. [Henry Company](#); Blueskin PE200 HT.
    - d. [Kirsch Building Products, LLC](#); Sharkskin Ultra SA.
    - e. [Metal-Fab Manufacturing, LLC](#); MetShield.
    - f. [Owens Corning](#); WeatherLock Specialty Tile & Metal Underlayment.
    - g. [Polyguard Products, Inc.](#); Deck Guard HT.
    - h. [Protecto Wrap Company](#); Protecto Jiffy Seal Ice & Water Guard HT.
    - i. [SDP Advanced Polymer Products Inc](#); Palisade SA-HT.
  2. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
  3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.
- D. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

#### 2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
  1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
    - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
    - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
    - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
  2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
  3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch and 1/8 inch thick.

- D. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.
- H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

## 2.5 MANUFACTURED REGLETS

- A. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. [Cheney Flashing Company](#).
    - b. [Fry Reglet Corporation](#).
    - c. [Heckmann Building Products, Inc.](#)
    - d. [Hickman, W. P. Company](#).
    - e. [Hohmann & Barnard, Inc.](#)
    - f. [Keystone Flashing Company, Inc.](#)
    - g. [National Sheet Metal Systems, Inc.](#)
    - h. [Sandell Manufacturing](#).
  - 2. Material: Stainless steel, 0.019 inch thick, Aluminum, 0.024 inch thick
  - 3. Finish: With manufacturer's standard color coating.

## 2.6 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
  - 1. Obtain field measurements for accurate fit before shop fabrication.
  - 2. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.

3. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
  2. Use lapped expansion joints only where indicated on Drawings.
- C. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- D. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- E. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.
- F. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.
- H. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer.

## 2.7 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch-long sections. Furnish flat-stock gutter brackets and gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.
1. Accessories: Continuous, removable leaf screen with sheet metal frame and hardware cloth screen.
- B. Downspouts: Fabricate round downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.
1. Hanger Style: Strap.
  2. Fabricate from the following materials:
    - a. Aluminum: 0.024 inch thick.
    - b. Stainless Steel: 0.016 inch thick.

## 2.8 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof Edge Flashing Gravel Stop and Fascia Cap: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long sections. Furnish with 6-inch-wide, joint cover plates. Shop fabricate interior and exterior corners.
  - 1. Fabricate from the Following Materials:
    - a. Aluminum: 0.050 inch thick.
    - b. Stainless Steel: 0.019 inch thick.
- B. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
  - 1. Aluminum: 0.040 inch thick.
  - 2. Stainless Steel: 0.019 inch thick.
- C. Counterflashing and Flashing Receivers: Fabricate from the following materials:
  - 1. Aluminum: 0.032 inch thick.
  - 2. Stainless Steel: 0.019 inch thick.
- D. Roof-Penetration Flashing: Fabricate from the following materials:
  - 1. Stainless Steel: 0.019 inch thick.
- E. Roof-Drain Flashing: Fabricate from the following materials:
  - 1. Stainless Steel: 0.016 inch thick.

## 2.9 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Apron, Step, Cricket, and Backer Flashing: Fabricate from the following materials:
  - 1. Aluminum: 0.032 inch thick.
  - 2. Stainless Steel: 0.016 inch thick.
- B. Valley Flashing: Fabricate from the following materials:
  - 1. Stainless Steel: 0.019 inch thick.
- C. Drip Edges: Fabricate from the following materials:
  - 1. Aluminum: 0.032 inch thick.
  - 2. Stainless Steel: 0.016 inch thick.
- D. Eave, Rake, and Ridge Flashing: Fabricate from the following materials:
  - 1. Aluminum: 0.032 inch thick.
  - 2. Stainless Steel: 0.016 inch thick.

## 2.10 WALL SHEET METAL FABRICATIONS

- A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch-long, but not exceeding 12-foot-long, sections, under copings, and at shelf angles. Fabricate discontinuous

lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings; and form with 2-inch-high, end dams. Fabricate from the following materials:

1. Stainless Steel: 0.016 inch thick.

B. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high, end dams. Fabricate from the following materials:

1. Aluminum: 0.032 inch thick.

2. Stainless Steel: 0.016 inch thick.

## PART 3 - EXECUTION

### 3.1 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

B. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, according to manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.

C. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.

### 3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.

4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.

5. Torch cutting of sheet metal flashing and trim is not permitted.



- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
  - 1. Coat concealed side of uncoated-aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
  - 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
  - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
  - 2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- G. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

### 3.3 ROOF-DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Hanging Gutters: Join sections with joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.
  - 1. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.
  - 2. Install continuous gutter screens on gutters with noncorrosive fasteners, removable for cleaning gutters.
- C. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c.

- D. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints minimum of 4 inches in direction of water flow.

### 3.4 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate.
- C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
- D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches.
- E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

### 3.5 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of through-wall flashing is specified in Section 042000 "Unit Masonry."
- C. Reglets: Installation of reglets is specified in Section 042000 "Unit Masonry."
- D. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

### 3.6 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.

- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

END OF SECTION 076200

**SECTION 077100**  
**ROOF SPECIALTIES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Roof-edge flashings.
  - 2. Roof-edge drainage systems.
  - 3. Reglets and counterflashings.

**1.2 PERFORMANCE REQUIREMENTS**

- A. FM Approvals' Listing: Manufacture and install roof-edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with FM Approvals' markings.
- B. SPRI Wind Design Standard: Manufacture and install roof-edge flashings tested according to SPRI ES-1. Design wind speed is as follows:
  - 1. Basic design wind speed: 115 mph.
  - 2. Exposure category: B.

**1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For roof specialties. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
- C. Samples: For each exposed product and for each color and texture specified.

**1.4 INFORMATIONAL SUBMITTALS**

- A. Product test reports.
- B. Warranty: Sample of special warranty.

## 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

## 1.6 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at Project site.

## 1.7 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 EXPOSED METALS

- A. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.
  - 1. Surface: Smooth, flat finish.
  - 2. Color Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
- B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.

### 2.2 CONCEALED METALS

- A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.
- B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.

### 2.3 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
- B. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
  2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
- C. Polyethylene Sheet: 6-mil-thick polyethylene sheet complying with ASTM D 4397.
- D. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

#### 2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
  2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
  3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
- C. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.
- D. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- F. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

#### 2.5 ROOF-EDGE FLASHINGS

- A. Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet and a continuous formed- or extruded-aluminum anchor bar with integral drip-edge cleat to engage fascia cover. Provide matching corner units.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. [Hickman Company, W. P.](#)
    - b. [Johns Manville.](#)
    - c. [Metal-Era, Inc.](#)
    - d. [Metal-Fab Manufacturing, LLC.](#)
    - e. [National Sheet Metal Systems, Inc.](#)
    - f. [Perimeter Systems; a division of Southern Aluminum Finishing Company, Inc.](#)

2. Fascia Cover: Fabricated from the following exposed metal:
  - a. Formed Aluminum: Thickness as required to meet performance requirements.
  3. Corners: Factory mitered and mechanically clinched and sealed watertight.
  4. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
  5. Fascia Accessories: Soffit trim.
- B. One-Piece Gravel Stops: Manufactured, one-piece, metal gravel stop in section lengths not exceeding 12 feet, with a horizontal flange and vertical leg, fascia terminating in a drip edge, and concealed splice plates of same material, finish, and shape as gravel stop. Provide matching corner units.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. [Architectural Products Company.](#)
    - b. [Berger Building Products, Inc.](#)
    - c. [Castle Metal Products.](#)
    - d. [Cheney Flashing Company.](#)
    - e. [Hickman Company, W. P.](#)
    - f. [Metal-Era, Inc.](#)
    - g. [Metal-Fab Manufacturing, LLC.](#)
    - h. [MM Systems Corporation.](#)
    - i. [National Sheet Metal Systems, Inc.](#)
    - j. [Perimeter Systems; a division of Southern Aluminum Finishing Company, Inc.](#)
    - k. [Petersen Aluminum Corporation.](#)
  2. Fabricate from the following exposed metal:
    - a. Formed Aluminum: Thickness as required to meet performance requirements.
    - b. Stainless Steel: Thickness as required to meet performance requirements.
  3. Corners: Factory mitered and mechanically clinched and sealed watertight.
  4. Accessories: Soffit trim.
- C. Aluminum Finish: Color anodic.
  1. Color: As selected by Architect from manufacturer's full range.
- D. Stainless-Steel Finish: No. 4 (bright, polished directional satin).

## 2.6 ROOF-EDGE DRAINAGE SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  1. [Andreas Renner KG.](#)
  2. [Architectural Products Company.](#)

3. [ATAS International, Inc.](#)
4. [Berger Building Products, Inc.](#)
5. [Castle Metal Products.](#)
6. [Cheney Flashing Company.](#)
7. [CopperCraft by FABRAL; a Euramax company.](#)
8. [Hickman Company, W. P.](#)
9. [Klauer Manufacturing Company.](#)
10. [Merchant & Evans, Inc.](#)
11. [Metal-Era, Inc.](#)
12. [Metal-Fab Manufacturing, LLC.](#)
13. [MM Systems Corporation.](#)
14. [National Sheet Metal Systems, Inc.](#)
15. [Perimeter Systems; a division of Southern Aluminum Finishing Company, Inc.](#)

B. Gutters: Manufactured in uniform section lengths not exceeding 12 feet, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.

1. Fabricate from the following exposed metal:
  - a. Formed Aluminum: 0.050 inch thick.
2. Gutter Profile: Style I according to SMACNA's "Architectural Sheet Metal Manual."
3. Corners: Factory mitered and mechanically clinched and sealed watertight.
4. Gutter Supports: Spikes and ferrules with finish matching the gutters.
5. Gutter Accessories: Continuous screened leaf guard with sheet metal frames.

C. Downspouts: Corrugated round complete with machine-crimped elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.

1. Formed Aluminum: 0.050 inch thick.

D. Aluminum Finish: Color anodic.

1. Color: As selected by Architect from manufacturer's full range.

E. Stainless-Steel Finish: No. 4 (bright, polished directional satin).

## 2.7 REGLETS AND COUNTERFLASHINGS

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

1. [Castle Metal Products.](#)
2. [Cheney Flashing Company.](#)



3. [Fry Reglet Corporation.](#)
4. [Heckmann Building Products Inc.](#)
5. [Hickman Company, W. P.](#)
6. [Keystone Flashing Company, Inc.](#)
7. [Metal-Era, Inc.](#)
8. [Metal-Fab Manufacturing, LLC.](#)
9. [MM Systems Corporation.](#)
10. [National Sheet Metal Systems, Inc.](#)

B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:

1. Formed Aluminum: 0.050 inch thick.
2. Stainless Steel: 0.025 inch thick.
3. Corners: Factory mitered and mechanically clinched and sealed watertight.
4. Masonry Type, Embedded: Provide reglets with offset top flange for embedment in masonry mortar joint.

C. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches and in lengths not exceeding 12 feet designed to snap into reglets and compress against base flashings with joints lapped, from the following exposed metal:

1. Formed Aluminum: 0.032 inch thick.
2. Stainless Steel: 0.025 inch thick.

D. Accessories:

1. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where reglet is provided separate from metal counterflashing.
2. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

E. Aluminum Finish: Color anodic.

1. Color: As selected by Architect from manufacturer's full range.

F. Stainless-Steel Finish: No. 4 (bright, polished directional satin).

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use

fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Install roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.
5. Install underlayment with adhesive for temporary anchorage. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches. Roll laps of self-adhering sheet underlayment with roller; cover within 14 days.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum and stainless-steel roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction, minimum dry film thickness of 30 mils.
2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of self-adhering, high-temperature sheet underlayment.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise shown on Drawings.
2. When ambient temperature at time of installation is between 40 and 70 deg F set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that will penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

E. Seal joints with sealant as required by roofing-specialty manufacturer.

F. Seal joints as required for watertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

### 3.2 ROOF-EDGE FLASHING INSTALLATION

A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

### 3.3 ROOF-EDGE DRAINAGE-SYSTEM INSTALLATION

- A. General: Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions.
- B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 12 inches. Attach ends with rivets and seal with sealant to make watertight. Slope to downspouts.
  - 1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet apart. Install expansion joint caps.
  - 2. Install continuous leaf guards on gutters with noncorrosive fasteners, removable for cleaning gutters.
- C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c.
- D. Conductor Heads: Anchor securely to wall with elevation of conductor top edge 1 inch gutter discharge.

### 3.4 REGLET AND COUNTERFLASHING INSTALLATION

- A. Embedded Reglets: See Section 042000 "Unit Masonry" for installation of reglets.
- B. Surface-Mounted Reglets: Install reglets to receive flashings where flashing without embedded reglets is indicated on Drawings. Install at height so that inserted counterflashings overlap 4 inches over top edge of base flashings.
- C. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches and bed with sealant. Fit counterflashings tightly to base flashings.

### 3.5 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as roof specialties are installed.

END OF SECTION 077100

## **SECTION 077253**

### **SNOW GUARDS**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

###### **A. Section Includes:**

1. Pad-type, seam-mounted snow guards.

##### **1.2 ACTION SUBMITTALS**

###### **A. Product Data:** For each type of product.

###### **B. Shop Drawings:** Include roof plans showing layouts and attachment details of snow guards.

1. Include calculation of number and location of snow guards based on snow load, roof slope, roof type, components, spacings, and finish.

###### **C. Samples.**

##### **1.3 INFORMATIONAL SUBMITTALS**

###### **A. Product test reports.**

#### **PART 2 - PRODUCTS**

##### **2.1 PERFORMANCE REQUIREMENTS**

###### **A. Performance Requirements:** Provide snow guards that withstand exposure to weather and resist thermally induced movement without failure, rattling, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

###### **B. Structural Performance:**

1. Snow Loads: As indicated on Drawings.

## 2.2 PAD-TYPE SNOW GUARDS

### A. Seam-Mounted Metal Snow Guard Pads:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. [Alpine SnowGuards; a division of Vermont Slate & Copper Services, Inc.](#)
  - b. [Berger Building Products.](#)
2. Material, Finish, and Color: Cast aluminum; powder coat; color as selected by Architect from manufacturer's full range.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, snow guard attachment, and other conditions affecting performance of the Work.

### 3.2 INSTALLATION

- A. Install snow guards according to manufacturer's written instructions. Space rows as recommended by manufacturer.
- B. Attachment for Standing-Seam Metal Roofing:
  1. Do not use fasteners that will penetrate metal roofing, or fastening methods that void metal roofing finish warranty.
  2. Seam-Mounted Metal Snow Guard Pads: Stainless-steel clamps attached to vertical ribs of standing-seam metal roof panels.

END OF SECTION 077253

## **SECTION 079200**

### **JOINT SEALANTS**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

###### **A. Section Includes:**

1. Silicone joint sealants.

##### **1.2 PRECONSTRUCTION TESTING**

- A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers eight samples of materials that will contact or affect joint sealants. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
- B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates. Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

##### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each joint-sealant product indicated.
- B. Samples: For each kind and color of joint sealant required.
- C. Joint-Sealant Schedule: Include the following information:
  1. Joint-sealant application, joint location, and designation.
  2. Joint-sealant manufacturer and product name.
  3. Joint-sealant formulation.
  4. Joint-sealant color.

##### **1.4 INFORMATIONAL SUBMITTALS**

- A. Product test reports.
- B. Preconstruction compatibility and adhesion test reports.
- C. Preconstruction field-adhesion test reports.

- D. Field-adhesion test reports.
- E. Warranties.

#### 1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.
- B. Preinstallation Conference: Conduct conference at Project site.

#### 1.6 WARRANTY

- A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: 10 years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS, GENERAL

- A. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
  - 1. Architectural Sealants: 250 g/L.
  - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
  - 3. Sealant Primers for Porous Substrates: 775 g/L.
- B. Low-Emitting Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- D. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

## 2.2 SILICONE JOINT SEALANTS

### A. Mildew-Resistant, Neutral-Curing Silicone Joint Sealant: ASTM C 920.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. [BASF Building Systems.](#)
  - b. [Dow Corning Corporation.](#)
  - c. [GE Advanced Materials - Silicones.](#)
  - d. [May National Associates, Inc.](#)
  - e. [Pecora Corporation.](#)
  - f. [Polymeric Systems, Inc.](#)
  - g. [Schnee-Morehead, Inc.](#)
  - h. [Sika Corporation; Construction Products Division.](#)
  - i. [Tremco Incorporated.](#)
2. Type: Single component (S).
3. Grade: Nonsag (NS).
4. Class: 100/50.
5. Uses Related to Exposure: Nontraffic (NT).

### B. Preformed Foam Joint Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from urethane foam with minimum density of 10 lb/cu. ft. and impregnated with a nondrying, water-repellent agent. Factory produce in

## 2.3 JOINT SEALANT BACKING

- ### A. 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.



- B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

## 2.4 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
  - 1. Remove laitance and form-release agents from concrete.
  - 2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.2 INSTALLATION

- A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
  2. Do not stretch, twist, puncture, or tear sealant backings.
  3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place sealants so they directly contact and fully wet joint substrates.
  2. Completely fill recesses in each joint configuration.
  3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
  2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
- F. Acoustical Sealant Installation: Comply with ASTM C 919 and with manufacturer's written recommendations.
- G. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

### 3.3 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
1. Extent of Testing: Test completed and cured sealant joints as follows:
    - a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
    - b. Perform 1 test for each 1000 feet of joint length thereafter.
  2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

- B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

### 3.4 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
  - 1. Joint Locations:
    - a. Construction joints in cast-in-place concrete.
    - b. Control and expansion joints in unit masonry.
    - c. Joints between different materials listed above.
    - d. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
    - e. Other joints as indicated.
  - 2. Joint Sealant: Silicone.
  - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
  - 1. Joint Locations:
    - a. Perimeter joints of exterior openings where indicated.
    - b. Tile control and expansion joints.
    - c. Vertical joints on exposed surfaces of interior unit masonry walls and partitions.
    - d. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
    - e. Other joints as indicated.
  - 2. Joint Sealant: Latex.
  - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
  - 1. Joint Sealant Location:
    - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    - b. Tile control and expansion joints where indicated.
    - c. Other joints as indicated.
  - 2. Joint Sealant: Silicone.
  - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

- D. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces
1. Joint Location:
    - a. Acoustical joints where indicated.
    - b. Other joints as indicated.
  2. Joint Sealant: Acoustical.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION 079200

**SECTION 081113  
HOLLOW METAL DOORS AND FRAMES**

**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. Interior hollow-metal doors, frames, and borrowed light frames.
- 2. Exterior hollow-metal doors, frames, glazed openings, and insulated panels.

B. Related Requirements:

- 1. Section 042000 "Unit Masonry" for Mortar: Grout fill of metal frames.
- 2. Section 079200 "Joint Sealants" for Sealing of joints between masonry and frames. Sealing of glazing.
- 3. Section 081119 "Stainless-Steel Doors and Frames" for hollow-metal doors and frames manufactured from stainless steel.
- 4. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.
- 5. Section 088000 "Glazing" for glazed openings, including fire-rated glass and plastic glazing.
- 6. Section 099113 "Exterior Painting" for finishes for exterior hollow-metal doors and frames.
- 7. Section 099123 "Interior Painting" for finishes for interior hollow-metal doors and frames.

**1.3 PRODUCTS FURNISHED AND INSTALLED UNDER THIS SECTION**

- A. Hollow metal doors, swinging type, as indicated on drawings.
- B. Doors shall include glass moldings and stops, louvers and other as shown in the schedule on the contract drawings and specified herein.
- C. Hollow metal frames as indicated on drawings with anchors.

- D. Frames shall include glass moldings and stops, louvers and other as shown in the schedule on the contract drawings and specified herein.

1.4 REFERENCES

*NOTE: The publications listed in this section form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only. Contractor/Supplier/Installer should comply with the referenced standard. When a more recent standard may be considered, Contractor/Supplier/Installer shall request the Department of Public Property's approval.*

A. Standards Agencies:

ANSI . . . . .	American National Standards Institute, Inc., 1430 Broadway Avenue, New York, New York 10018.
ASTM . . . . .	American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428.
NAAMM . . . . .	National Association of Architectural Metal Manufacturers, 600 South Federal Street, Chicago, Illinois 60605.
NFPA . . . . .	National Fire Protection Association 1 Batterymarch Park P.O. Box 9101 Quincy, MA 02269
UL . . . . .	Underwriters Laboratory, 333 Pfingsten Road, Northbrook, Illinois 60062.

B. STANDARDS:

1. ANSI A250.4-2011, Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Hardware Reinforcings
2. ANSI A250.10-2011 Standard Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames
3. ANSI/NAAMM HMMA 801-12, Glossary of Terms for Hollow Metal Doors and Frames
4. ANSI/NFPA 80 -2015, 16<sup>th</sup> Edition, Standard for Fire Doors and Fire Windows

5. ANSI/NFPA 252-2017, Standard Methods of Fire Tests of Door Assemblies
6. ANSI/UL 10B-2009, Fire Tests of Door Assemblies, 9th edition
7. ANSI/UL 10C-2016, Positive Pressure Fire Test of Door Assemblies, 1st Edition
8. ASTM A 653/A 653M-15, Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
9. ASTM A 1008/A 1008M-16, Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength Low-Alloy, High Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
10. ASTM A 1011/A 1011M-17a, Specification for Steel, Sheet, and Strip, Hot-Rolled, Carbon, Structural, High Strength Low-Alloy and High Strength Low-Alloy with Improved Formability
11. ASTM B117-16 Method of Salt Spray (Fog) Testing.
12. ASTM C 143/C 143M-15a, Test Method for Slump of Hydraulic-Cement Concrete
13. ASTM D1735-14, Practice for Testing Water Resistance of Coating Using Water Fog Apparatus.
14. NAAMM HMMA 802-07, Manufacturing of Hollow Metal Doors and Frames
15. NAAMM HMMA 803-08, Steel Tables
16. NAAMM HMMA 810-08, Hollow Metal Doors
17. NAAMM HMMA 810 TN01-03, Defining Undercuts
18. NAAMM HMMA 820-87, Hollow Metal Frames
19. NAAMM HMMA 820 TN01-03, Grouting Hollow Metal Frames
20. NAAMM HMMA 820 TN02-03, Continuously Welded
21. NAAMM HMMA 830-02, Hardware Selection for Hollow Metal Doors and Frames
22. NAAMM HMMA 831-11, Recommended Hardware Locations for Hollow Metal Doors and Frames
23. ANSI/NAAMM HMMA 861-14 Commercial Hollow Metal Doors and Frames 3
24. NAAMM HMMA 840-16, Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames

## 25. NAAMM HMMA 850-14, Fire-Rated Hollow Metal Doors and Frames

### 1.5 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

### 1.6 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.
- C. Coordinate requirements for installation of glazing.

### 1.7 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at the Project Site.

### 1.8 TESTING AND PERFORMANCE

- A. Performance Test for Steel Doors and Hardware Reinforcements (ANSI A151.1)
- B. The test specimen shall be a 3' - 0" x 7' - 0" nominal size 1¾" door.
- C. The specimen shall be tested in accordance with the ANSI A151.1 procedure for the Level "A" doors (1,000,000 cycles).
  - 1. The specimen shall be tested in accordance with the ANSI AI 51.1 procedure for twist test which requires a maximum pressure of 300 lbs. pressure.
- D. All test reports shall include a description of the test specimen, procedures used in testing, and indicate compliance with the acceptance criteria of the test.
- E. Labeled Fire-Rated Doors and Frame Product.
  - 1. Doors, frames, transom frames and sidelight assemblies provided for openings requiring fire, temperature rise, shall be listed and/or classified and bear the label of a testing agency having a factory inspection service. The product shall be tested in accordance with ANSI/NFPA 252 or ANSI/UL-10B, ANSI, UL-10C and constructed as listed or classified for labeling. Fire, temperature rise and/or smoke and draft control ratings shall be determined and scheduled by the Architect.



2. If any door or frame product specified by the Architect to be fire-rated cannot qualify for labeling because of design, hardware or any other reason, the Architect shall be so advised in the submittal documents. If hardware, glazing, or other options affect the fire-rating and are unknown at the time of submittal document preparation, the architect shall be advised.

## 1.9 QUALITY ASSURANCE

### A. Manufacturer's Qualifications:

1. Manufacturer shall provide evidence of having personnel and plant equipment capable of fabricating hollow metal door and frame assemblies of the type specified herein.

### B. Installer Qualifications:

1. Installer, trained by the primary product manufacturer, with a minimum of five (5) years documented experience installing hollow metal doors and frame assemblies similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

### C. Quality Criteria:

1. All door and frame assemblies shall meet the requirements of Paragraph 1.8 of these specifications.
2. Fire labeled doors and frames shall be provided for those openings requiring fire protection ratings as determined and scheduled by the Architect and as required by the applicable Building Code. Such doors and frames shall be constructed as tested in accordance with ASTM E152 (UL-10B) and approved by Underwriters Laboratories or other recognized testing agencies having a factory inspection service.
3. If any door or frame specified by the Architect to be fire-rated cannot qualify for appropriate labeling because of its design, hardware or any other reason, the Architect shall be so advised before fabricating work on that item is started.
4. Fabrication methods and product quality shall meet the standards set by the Hollow Metal Manufacturers Association, HMMA, a Division of the National Association of Architectural Manufacturers, NAAMM, as set forth in these specifications.

## 1.10 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:
  1. Elevations of each door type.

2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
  3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
  4. Locations of reinforcement and preparations for hardware.
  5. Details of each different wall opening condition.
  6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
  7. Details of anchorages, joints, field splices, and connections.
  8. Details of accessories.
  9. Details of moldings, removable stops, and glazing.
- C. Samples for Initial Selection: For hollow-metal doors and frames.
1. Samples for Verification (No work to be fabricated until samples are approved):
  2. Finishes: For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches (75 by 127 mm).
  3. Fabrication: Prepare Samples approximately 8 by 10 inches (203 by 254 mm) corner section to demonstrate compliance with requirements for quality of materials and construction:
    - a. Doors: Show vertical-edge including welding joint of head to jamb, top, and bottom construction; core construction; and hinge, hinge mortise and other applied hardware reinforcement. Include separate section showing glazing if applicable with glazing stop applied to both head and jamb section to show corner joint.
    - b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing with stops if applicable.
- D. Product Schedule: For hollow-metal doors and frames, show each door and opening, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule – Show hardware group on schedule. Provide one schedule for the entire project – coordinate schedule for doors and openings of materials specified in other sections.

#### 1.11 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of fire-rated hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

- B. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
  - 1. Provide additional protection to prevent damage to factory-finished units.
- C. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- D. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Amweld International, LLC.
  - 2. Ceco Door; ASSA ABLOY.
  - 3. Curries Company; ASSA ABLOY.
  - 4. Greensteel Industries, Ltd.
  - 5. North American Door Corp.
  - 6. Pioneer Industries.
  - 7. Republic Doors and Frames.
  - 8. Steelcraft; an Allegion brand.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than **0.70 deg Btu/F x h x sq. ft.** when tested according to ASTM C 518.

### 2.3 INTERIOR HOLLOW-METAL DOORS AND FRAMES

- A. Hollow-Metal Doors (Extra Heavy-Duty, SDI A250.8, Level 3) and Frames (Maximum Heavy-Duty, SDI A250.8, Level 4): NAAMM-HMMA 861; SDI A250.4, Physical Performance Level A. At locations indicated in the Door and Frame Schedule.

1. Doors:

- a. Type: As indicated in the Door and Frame Schedule.
- b. Thickness: 1-3/4 inches. Doors shall be neat in appearance and free from warping or buckle. Edge bends shall be true and straight and of minimum radius for the thickness of the metal used.
- c. Face: Face sheets shall be 0.053 in. (1.3 mm) minimum thickness and shall be manufactured from cold-rolled steel conforming to ASTM A 1008/A 1008M, or hot-rolled, pickled and oiled (HRPO) steel conforming to ASTM A 1011/A 1011M CS Type B. Steel shall be free of scale, pitting, coil breaks or surface blemishes, buckles, waves or other defects. For interior areas subject to corrosive conditions provide zinc coated face sheets as specified below in 2.4 A.1.c.
- d. Edge Construction: Door face sheets shall be joined at their vertical edges by a continuous weld extending the full height of the door with no visible seams on their faces or vertical edges per HMMA-801-83. Joint shall be set toward the center of the vertical edge of the door. A joint at the corner of the door face and the vertical edge is not accepted. The top and bottom edges shall be closed with a continuous channel, also not less than 0.053" thickness, spot welded to both sheets.
- e. Edge Profiles: Edge profiles shall be provided on both vertical edges of single acting doors as follows: beveled 1/8" in 1 3/4" profile. All hardware for single acting doors shall be designed for beveled edges as specified.
- f. Core: The door shall be stiffened by continuous vertically formed steel sections which, upon assembly, shall span the full thickness of the interior space between door faces. These stiffeners shall be 0.030" minimum thickness, spaced so that the vertical interior webs shall be no more than 6" apart and securely fastened to both face sheets by spot welds spaced a maximum of 5" o.c. vertically. Spaces between stiffeners shall be filled with fiberglass, batt-type material.
- g. Fire-Rated Core: Manufacturer's standard vertical steel stiffener core for fire-rated doors.

2. Frames:

- a. Materials: cold rolled steel conforming to ASTM A1008/A1008/M CS Type B, or hot-rolled, pickled and oiled (HRPO) steel conforming to ASTM A 1011/A1011M CS Type B. Minimum thickness: In openings 4' - 0" or less, steel shall be 0.053" (1.3 mm) minimum thickness. In openings greater than 4' - 0", steel shall be 0.067" (1.7 mm) minimum thickness. For interior areas subject to corrosive conditions provide metallic coated as specified below in 2.4 A.2.a.
- b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
- c. Construction: Full profile welded.
  - 1) All frames shall have integral stops and be welded units of the sizes and types shown in the contract drawings.
  - 2) Corner joints shall have all contact edges closed tight with miter faces, and either butted or miter stops. Faces and soffits shall be continuously welded

and the faces finished smooth. The use of gussets or splice plates as a substitute for welding shall not be acceptable.

- 3) All other face joints shall be continuously welded and smoothly finished.
  - 4) Minimum depth of stops shall be  $\frac{5}{8}$ ". Cut-off stops, where shown, shall be capped at heights as shown in the contract drawings, and jamb joints below cut-off stops shall be welded, filled and ground smooth so that there are no visible seams
  - 5) When shipping limitations so dictate, frames for large openings shall be fabricated in sections designated for assembly in the field by others. Alignment plates or angles shall be installed at each joint. Such components shall be the same thickness as the frame. Field joints shall be made in accordance with approved submittal drawings and shall be field welded.
3. Exposed Finish: Prime. After fabrication, all tool marks and surface blemishes shall be filled and sanded as required to make all exposed faces and vertical edges, and welded joints, smooth and free from irregularities. Metallic Coated surfaces shall be treated to insure maximum paint adhesion. After appropriate preparation, all exposed and accessible surfaces shall receive a rust inhibiting primer which meets or exceeds ASTM B117 salt spray for 150 hours and ASTM D1 735 water fog test for organic coatings for 200 hours, and which is fully cured prior to shipment.
- a. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
  - b. Construction: Full profile welded.
    - 1) All frames shall have integral stops and be welded units of the sizes and types shown in the contract drawings.
    - 2) Corner joints shall have all contact edges closed tight with miter faces, and either butted or miter stops. Faces and soffits shall be continuously welded and the faces finished smooth. The use of gussets or splice plates as a substitute for welding shall not be acceptable.
    - 3) All other face joints shall be continuously welded and smoothly finished.
    - 4) Minimum depth of stops shall be  $\frac{5}{8}$ ". Cut-off stops, where shown, shall be capped at heights as shown in the contract drawings, and jamb joints below cut-off stops shall be welded, filled and ground smooth so that there are no visible seams
    - 5) When shipping limitations so dictate, frames for large openings shall be fabricated in sections designated for assembly in the field by others. Alignment plates or angles shall be installed at each joint. Such components shall be the same thickness as the frame. Field joints shall be made in accordance with approved submittal drawings and shall be field welded.
4. Exposed Finish: Prime. After fabrication, all tool marks and surface blemishes shall be filled and sanded as required to make all exposed faces and vertical edges, and welded joints, smooth and free from irregularities. Metallic Coated surfaces shall be treated to insure maximum paint adhesion. After appropriate preparation, all exposed and accessible

surfaces shall receive a rust inhibiting primer which meets or exceeds ASTM B117 salt spray for 150 hours and ASTM D1 735 water fog test for organic coatings for 200 hours, and which is fully cured prior to shipment.

2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES (Exterior Hollow Metal Doors and Frames are always to be fabricated of Stainless Steel unless specially approved by PPR to follow the below specifications for existing or retrofit conditions. See related Specification Section 081119 Stainless Steel Doors and Frames.)

A. Maximum Duty Doors and Frames: NAAMM-HMMA 861; SDI A250.8, Level 4; SDI A250.4, Physical Performance Level A. At locations indicated in the Door and Frame Schedule

1. Doors:

- a. Type: As indicated in the Door and Frame Schedule.
- b. Thickness: 1-3/4 inches. Doors shall be neat in appearance and free from warping or buckle. Edge bends shall be true and straight and of minimum radius for the thickness of the metal used.
- c. Face: Metallic-coated steel sheet, minimum thickness of 0.067 inch (1.70 mm), with minimum G60 or A60 (ZF180) with a coating weight of not less than 0.60 ounces per square foot (0.30 ounces per square foot per side).
- d. Edge Construction: Continuously welded with no visible seam. Door face sheets shall be joined at their vertical edges by a continuous weld extending the full height of the door with no visible seams on their faces or vertical edges per HMMA-801-83. Joint shall be set toward the center of the vertical edge of the door. A joint at the corner of the door face and the vertical edge is not accepted.
- e. Edge Profiles: Edge profiles shall be provided on both vertical edges of single acting doors as follows: beveled 1/8" in 1 3/4" profile. All hardware for single acting doors shall be designed for beveled edges as specified.
- f. Top Edge Closures: Close top edges of doors with flush continuous channel closures of same material as face sheets, spot welded to both sheets. Fit Exterior Doors with an additional flush closing channel at the top edge. Seal joints against water penetration.
- g. Bottom Edges: Close bottom edges of doors with flush continuous channel closures of same material as face sheets, spot welded to both sheets. Where required for attachment of weather stripping an additional flush closing channel with end closures of same material as face sheets shall be provided. Provide weep-hole openings in bottoms closure channels of exterior doors to permit moisture to escape.
- h. Core: Steel stiffened. The door shall be stiffened by continuous vertically formed steel sections which, upon assembly, shall span the full thickness of the interior space between door faces. These stiffeners shall be 0.030" minimum thickness, spaced so that the vertical interior webs shall be no more than 6" apart and securely fastened to both face sheets by spot welds spaced a maximum of 5" o.c. vertically. Spaces between stiffeners shall be filled with fiberglass, batt-type material.

2. Frames:

- a. Materials: Metallic-coated steel sheet, minimum thickness of 0.09 inch (2.3 mm), except 0.12 inch (3 mm) for openings exceeding 4 feet (1219 mm) wide; with minimum G60 or A60 (ZF180) coating.
- b. Construction: Full profile welded.
  - 1) All frames shall have integral stops and be welded units of the sizes and types shown in the contract drawings.
  - 2) Corner joints shall have all contact edges closed tight with miter faces, and either butted or miter stops. Faces and soffits shall be continuously welded and the faces finished smooth. The use of gussets or splice plates as a substitute for welding shall not be acceptable.
  - 3) All other face joints shall be continuously welded and smoothly finished.
  - 4) Minimum depth of stops shall be  $\frac{5}{8}$ ". Cut-off stops, where shown, shall be capped at heights as shown in the contract drawings, and jamb joints below cut-off stops shall be welded, filled and ground smooth so that there are no visible seams
  - 5) When shipping limitations so dictate, frames for large openings shall be fabricated in sections designated for assembly in the field by others. Alignment plates or angles shall be installed at each joint. Such components shall be the same thickness as the frame. Field joints shall be made in accordance with approved submittal drawings and shall be field welded.
3. Exposed Finish: Primed. After fabrication, all tool marks and surface blemishes shall be filled and sanded as required to make all exposed faces and vertical edges, and welded joints, smooth and free from irregularities. Metallic Coated surfaces shall be treated to insure maximum paint adhesion. After appropriate preparation, all exposed and accessible surfaces shall receive a rust inhibiting primer which meets or exceeds ASTM B117 salt spray for 150 hours and ASTM D1 735 water fog test for organic coatings for 200 hours, and which is fully cured prior to shipment.

## 2.5 BORROWED LITES

- A. Fabricate frames and removable glazing channel stops from same thickness material as interior door frames as specified in Section 2.3 A.2.a. above. Stops to be butted at corner joints and secured to the frame using stainless steel #6 countersunk sheet metal screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.
- B. Construction: Full profile welded.
- C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.
- D. Borrowed lites in fire rated wall enclosures shall be prepared for listed glazing as required in accordance with the hollow metal assembly manufacturer's fire rating procedure.

## 2.6 HOLLOW-METAL INFILL PANELS

- A. Provide hollow-metal infill panels of same materials, construction, and finish as adjacent hollow metal door assemblies.

## 2.7 FRAME ANCHORS

- A. Jamb Anchors:

### 1. Masonry Type:

- a. Frames for installation in new masonry walls shall be provided with adjustable jamb anchors of the same material as the frame. Acceptable jamb anchors shall be TEE-strap or strap and stirrup type no less than 0.075" thickness, or wire type no less than 0.185" in diameter. Straps shall be no less than 2" x 10" in size, corrugated and/or perforated. All frames in new masonry shall be filled with grout. The number of anchors provided on each jamb shall be as follows:

- 1) Frames up to 60" ..., 2 anchors.
- 2) Frames greater than 60" up to 90" ..., 3 anchors.
- 3) Frames greater than 90" up to 96" ..., 4 anchors
- 4) Frames greater than 96", 4 anchors plus 1 for each 24" or fraction thereof over 96" spaced at 24" maximum between anchors (U.L. fire ratings may require additional anchors. Verify building and local code requirements, the most stringent will apply).

- b. Frames for installation in existing masonry or concrete walls shall be prepared for stainless steel expansion bolt type anchors. The preparation shall consist of a countersunk hole for a  $\frac{3}{8}$ " diameter bolt and a spacer from the unexposed surface of the frame to the wall. The spacer shall be welded to the frame and spaced a maximum of 6" from the top and bottom, with intermediate spacing at a maximum of 26" o.c. Fasteners for such anchors shall be stainless steel provided by Installer. All frames installed in exterior openings shall be filled with grout.

### 2. Dry Wall Type:

- a. Frames for installation in stud partitions shall be provided with steel anchors of suitable design, no less than 0.048" thickness, securely welded inside each jamb. The number of anchors provided on each jamb shall be as follows:

- 1) Frames up to 60" ..., 3 anchors.
- 2) Frames greater than 60" up to 90" ..., 4 anchors.
- 3) Frames greater than 90" up to 96" ..., 5 anchors.
- 4) Frames greater than 96", 5 anchors plus 1 for each 24" or fraction thereof over 96" spaced at 24" maximum between anchors (U.L. fire ratings may require



additional anchors. Verify building and local code requirements, the most stringent will apply).

3. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches (610 mm) of frame height above 7 feet (2.1 m).
4. Post-installed Expansion Anchor: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

1. Floor anchors with two holes for fasteners shall be fastened inside jambs with at least four (4) spot welded per anchor.
2. Where so scheduled for finish floor underlayment thickness, adjustable floor anchors, providing no less than 2" height adjustment, shall be fastened in place with at least four (4) spot welds per anchor.
3. Floor anchors shall be of the same material as the frame, with a minimum of 0.075" thickness.

C. Material: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M; hot-dip galvanized according to ASTM A 153/A 153M, Class B.

## 2.8 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B. with minimum G60 or A60 (ZF180) with a coating weight of not less than 0.60 ounces per square foot (0.30 ounces per square foot per side).
- D. Inserts, Bolts, and Fasteners: Stainless Steel where noted, otherwise, Hot-dip galvanized according to ASTM A 153/A 153M.

- E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- F. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- G. Glazing: Comply with requirements in Section 088000 "Glazing."

## 2.9 FABRICATION

- A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
  - 1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding
  - 2. Provide stainless steel countersunk sheet metal screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner for exposed fasteners unless otherwise indicated.
  - 3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
    - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
  - 4. Terminated Stops: Terminate stops [6 inches (152 mm)] <Insert dimension> above finish floor with a [45] [90]-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.
  - 5. Frames for installation in masonry wall openings more than 4' - 0" in width shall have an angle or channel stiffener made from the same material as the frame that shall be factory welded into the head when the head is to be grouted. Such stiffener shall not be used as lintel or load bearing member, shall not be longer than the opening width but not shorter than 1" and they shall not be less than 0.105" in thickness.

6. Plaster guards shall be provided and welded in place at all hardware mortises on frames to be set in masonry or concrete openings. They shall be made from the same material as the frame with not less than 0.019" thickness.
  7. Where specified or scheduled, Hollow Metal Infill Panels will be secured flush to the outside of exterior frames or flush to the secure side of interior frames. The Infill Panels will be anchored to the frame sections with loose stops and moldings on inside or non-secure side of hollow-metal frames. Provide stops for installation with stainless steel countersunk sheet metal screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.
- C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
  2. Where non-templated, mortised, and surface-mounted door hardware is to be applied, reinforce doors and frames, with all drilling and tapping done in the field, to receive:
    - a. Minimum thickness for hardware reinforcements in doors as follows:
      - 1) Full mortise hinges and pivots, 0.180".
      - 2) Reinforcements for lock fronts, concealed holders, or surface mounted closer, 0.105".
      - 3) Internal reinforcements for all other surface applied hardware 0.075".
    - b. Minimum thickness for hardware reinforcements in frames as follows:
      - 1) Hinge and pivot reinforcements ..., 0.195" x 1¼" >10" in length.
      - 2) Strike reinforcements ..., 0.105"
      - 3) Closer reinforcements ..., 0.105"
      - 4) Flush bolt reinforcements ..., 0.105"
      - 5) Reinforcements for surface applied hardware ..., 0.105"
      - 6) Reinforcements for hold open arms ..., 0.105"
      - 7) Reinforcements for surface panic devices ..., 0.105"
  3. In cases where electrically operated hardware is required, and indicated on architectural door schedule, conduit, hardware enclosures and/or junction boxes within the door shall be provided. Access plates where required shall be the same thickness as the door and fastened with a minimum of (4) #8-32 machine screws or #6 metal screws, not to exceed 12" o.c.
- D. Glazed Lites: Provide stops and moldings around glazed lites where indicated, made of the same material and material thickness as the door or frame. Form corners of stops and moldings with butted hairline joints.

1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated, to secure glazing coordinated in accordance with the glass sizes and thicknesses specified.
2. Multiple Glazed Lites: Provide welded, fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame stops and moldings on outside of exterior and on secure side of interior doors and frames. Fixed glass stops and molding shall be welded to the secure side. Provide loose stops and moldings on inside of hollow-metal doors and frames.
4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
5. Provide stops for installation with stainless steel countersunk sheet metal screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.
6. At Exterior doors, metallic-coated surfaces beneath the glazing stops and the inside of the glazing stop shall be treated for maximum paint adhesion and painted with a rust inhibiting primer prior to installation in the frame.
7. At Interior doors, the metal surfaces to which glazing stops are secured and the inside of the glazing stops shall be chemically treated for the maximum paint adhesion and painted with a rust inhibiting primer prior to installation in the door.
8. Fire rated doors shall be prepared for listed glazing as required in accordance with the door manufacturer's fire rating procedure.

## 2.10 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
  1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
- B. Factory Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, complying with SDI A250.3.
  1. Color and Gloss: As selected by Architect from manufacturer's full range.

## 2.11 LOUVERS

- A. Provide louvers for interior doors, where indicated, which comply with SDI 111, with blades or baffles formed of 0.0480-inch- (1.2-mm-) thick, cold-rolled steel sheet set into 0.053-inch- (1.3-mm-) thick steel frame.
  - 1. Sightproof Louver: Stationary louvers constructed with welded inverted-V or inverted-Y blades.
  - 2. Lightproof Louver: Stationary louvers constructed with welded baffles to prevent light from passing from one side to the other.
  - 3. Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible link, listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated by same qualified testing and inspecting agency that established fire-resistance rating of door assembly. Maximum louver size: 24" x 24" per leaf. Louvers are permitted in the lower portion of door only.
- B. Form corners of moldings with hairline joints. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.

## 2.12 CLEARANCES AND TOLERANCES

- A. Edge clearances for swinging doors shall not exceed the following
  - 1. Between doors and frames, at head and jambs ...,  $\frac{3}{16}$ ".
  - 2. Between edges of pairs of doors ...,  $\frac{1}{16}$ "
  - 3. At door sills where a threshold is used ...,  $\frac{3}{8}$ ". Measured from bottom of door to top of threshold.
  - 4. At door sills where no threshold is used ...,  $\frac{3}{4}$ ".
  - 5. Between door bottom and nominal surface of floor coverings at fire rated openings as provided in NFPA 80-990, Paragraph 2.5.5.
- B. Manufacturing tolerance shall be maintained within the following limits:
  - 1. Frames for single door or pair of doors:
    - a. Thickness of sheet metal ..., +0.015"; —0.007".
    - b. Width, measured between rabbets at the head. Nominal opening width ..., +  $\frac{1}{16}$ "; —  $\frac{1}{32}$ ".
    - c. Height (total length of jamb rabbet). Nominal opening height ..., +  $\frac{3}{64}$ ".
    - d. Cross sectional profile dimensions.
      - 1) Face ..., +  $\frac{1}{32}$ ".
      - 2) Stop ...,  $\pm \frac{1}{32}$ ".

- 3) Rabbet ..., +  $\frac{1}{32}$ ".
- 4) Depth ..., +  $\frac{1}{32}$ ".
- 5) Throat ...,  $\pm \frac{1}{16}$ ". Frames overlapping walls to have throat dimension  $\frac{1}{8}$ " greater than dimensioned wall thickness to accommodate irregularities in wall construction.

2. Doors:

- a. Thickness of sheet metal ... +0.015"; —0.007".
- b. Width ..., +  $\frac{3}{64}$ "
- c. Height ..., +  $\frac{3}{64}$ "
- d. Thickness ..., +  $\frac{1}{16}$ "
- e. Hardware cutout dimensions. Template dimensions ..., +0.015"; —0"
- f. Hardware location ..., +  $\frac{1}{32}$ "

2.13 HARDWARE LOCATIONS

1. The location of hardware on doors and frames shall be coordinated with the locations indicated in Specification Section 087100 Door Hardware.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Remove wraps or covers from doors and frames upon delivery at the building site. Record any damage or error in the hollow metal delivered to the job site, and notify the manufacturer/supplier on writing to maintain warranty and/or fire label
- B. Promptly clean and touch up any scratches or disfigurement caused in shipping or handling with a rust inhibiting primer
- C. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed. Check doors and frames for correct size, swing =, fire rating and opening number.
- D. Store hollow metal door and frame materials in a dry location on planks at least 4" off ground or 2" off floor slab. Doors shall be stored in a vertical position and spaced at least  $\frac{3}{8}$ " by wood strip or blocking. Materials shall be covered to protect them from damage but in such a manner as to permit air circulation. Place no more than 5 doors or welded frames in a group. In the case of multi-opening frames, no more than three units should be stored in a group, to avoid serious racking or other damage to the bottom of the frame
- E. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

### 3.2 INSTALLATION

- A. General: Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. The installer shall perform the following:
  - 1. Prior to installation, the area of floor on which the frame product is to be installed, and within the path of the door swing, shall be checked for flatness.
  - 2. Prior to installation, all interior surfaces of perimeter frame product sections to be installed in masonry or concrete walls shall be isolated and protected from grout and antifreeze agents.
- C. Doors and frame product shall be checked for correct size, swing, fire rating and opening number. Permissible installation tolerances shall not exceed the following:
  - 1. Squareness,  $\pm 1/16$ " measured on a line, 90 degrees from one jamb, at the upper corner of the frame at the other jamb.
  - 2. Squareness,  $\pm 1/16$ " measured on a line, 90 degrees from one jamb, at the upper corner of the frame at the other jamb.
  - 3. Twist,  $\pm 1/16$ " measured at face corners of jambs on parallel lines perpendicular to the plane of the wall.
  - 4. Plumbness,  $+1/16$ " measured on the jamb at the floor.
- D. Hollow-Metal Frames: Comply with NAAMM-HMMA 840.
  - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
    - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
    - b. Install frames with removable stops located on secure side of opening.
  - 2. Fire-Rated Openings: Install frames according to NFPA 80.
  - 3. Floor Anchors: Secure with post-installed expansion anchors.
    - a. Floor anchors may be set with power-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.

4. Hardware must be applied in accordance with hardware manufacturer's templates and instructions.
  5. Plaster guards and junction boxes are intended to protect hardware mortises and tapped mounting holes from masonry grout of 4" maximum slump consistency which is hand troweled in place. If a light consistency grout (greater than 5" slump when tested in accordance with ASTM C 143/C 143M) is to be used, special precautions must be taken in the field by the installation contractor to protect the aforementioned.
  6. Frame products are not intended or designed to act as forms for grout or concrete. Grouting of hollow metal sections shall be done in "lifts" or precautions shall be otherwise taken by the contractor to ensure that frames are not deformed or damaged by the hydraulic forces that occur during this process.
  7. Any grout or other bonding material shall be promptly cleaned off of frames or doors following installation. Hollow metal surfaces shall be kept free of grout, tar, or other bonding material or sealer.
  8. 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.
  9. Exposed hollow metal surfaces which have been scratched or otherwise marred during installation, cleaning, and/or field welding, shall promptly be finished smooth, cleaned, treated for maximum paint adhesion and touched up with a rust inhibitive primer comparable to and compatible with the shop applied primer and finish paint specified in Section 099000.
- E. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
1. Non-Fire-Rated Steel Doors: Comply with NAAMM-HMMA 841 and NAAMM-HMMA guide specification indicated.
  2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
  3. Smoke-Control Doors: Install doors according to NFPA 105.
- F. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

### 3.3 CLEANING AND TOUCHUP

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.



- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- C. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.
- D. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

**SECTION 081119**  
**STAINLESS STEEL DOORS AND FRAMES**

**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. Stainless-steel doors, frames, glazed openings, borrowed light frames, and insulated panels.

**B. Related Requirements:**

- 1. Section 042000 "Unit Masonry" for Mortar: Grout fill of metal frames.
- 2. Section 079200 "Joint Sealants" for Sealing of joints between masonry and frames. Sealing of glazing.
- 3. Section 081113 "Hollow Metal Doors and Frames" for hollow-metal doors and frames manufactured from steel.
- 4. Section 087100 "Door Hardware" for door hardware for stainless steel doors.
- 5. Section 088000 "Glazing" for glazed openings, including fire-rated glass and plastic glazing.

**1.3 PRODUCTS FURNISHED AND INSTALLED UNDER THIS SECTION**

- A. Stainless steel metal doors, swinging type, with fire rating as indicated on drawings.
- B. Doors shall include glass moldings and stops, louvers and other as shown in the schedule on the contract drawings and specified herein.
- C. Stainless steel frames as indicated on drawings with anchors.
- D. Frames shall include glass moldings and stops, louvers and other as shown in the schedule on the contract drawings and specified herein.

1.4 REFERENCES

NOTE: *The publications listed in this section form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only. Contractor/Supplier/Installer should comply with the referenced standard. When a more recent standard may be considered, Contractor/Supplier/Installer shall request the Philadelphia Parks and Recreation Department's approval.*

A. Standards Agencies:

ANSI . . . . .	American National Standards Institute, Inc., 1430 Broadway Avenue, New York, New York 10018.
ASTM . . . . .	American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428.
NAAMM . . . . .	National Association of Architectural Metal Manufacturers, 600 South Federal Street, Chicago, Illinois 60605.
NFPA . . . . .	National Fire Protection Association 1 Batterymarch Park P.O. Box 9101 Quincy, MA 02269
UL . . . . .	Underwriters Laboratory, 333 Pfingsten Road, Northbrook, Illinois 60062.

B. Standards:

1. ANSI A250.4-2011, Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Hardware Reinforcings
2. ANSI/NAAMM HMMA 801-12, Glossary of Terms for Hollow Metal Doors and Frames
3. ANSI/NFPA 80 -2015, 16<sup>th</sup> Edition, Standard for Fire Doors and Fire Windows
4. ANSI/NFPA 252-2017, Standard Methods of Fire Tests of Door Assemblies
5. ANSI/UL 10B-2009, Fire Tests of Door Assemblies, 9th edition
6. ANSI/UL 10C-2016, Positive Pressure Fire Test of Door Assemblies, 1st Edition
7. ASTM B117-16 Method of Salt Spray (Fog) Testing.

8. ASTM C 143/C 143M-15a, Test Method for Slump of Hydraulic-Cement Concrete
9. ASTM D1735-14, Practice for Testing Water Resistance of Coating Using Water Fog Apparatus.
10. NAAMM HMMA 802-07, Manufacturing of Hollow Metal Doors and Frames
11. NAAMM HMMA 803-08, Steel Tables
12. NAAMM HMMA 810-08, Hollow Metal Doors
13. NAAMM HMMA 810 TN01-03, Defining Undercuts
14. NAAMM HMMA 820-87, Hollow Metal Frames
15. NAAMM HMMA 820 TN01-03, Grouting Hollow Metal Frames
16. NAAMM HMMA 820 TN02-03, Continuously Welded
17. NAAMM HMMA 830-02, Hardware Selection for Hollow Metal Doors and Frames
18. NAAMM HMMA 831-11, Recommended Hardware Locations for Hollow Metal Doors and Frames
19. ANSI/NAAMM HMMA 866 Commercial Stainless Steel Doors and Frames
20. NAAMM HMMA 840-16, Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames
21. NAAMM HMMA 850-14, Fire-Rated Hollow Metal Doors and Frames

## 1.5 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

## 1.6 COORDINATION

- A. Coordinate anchorage installation for stainless steel frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.
- C. Coordinate requirements for installation of glazing.

## 1.7 PREINSTALLATION MEETINGS

- A. Preinstallation Conference combined with Hollow Metal Doors and Frames Preinstallation Conference: Conduct conference at the Project Site.

## 1.8 TESTING AND PERFORMANCE

- A. Performance Test for Steel Doors and Hardware Reinforcements (ANSI A151.1)
- B. The test specimen shall be a 3' - 0" x 7' - 0" nominal size 1¾" door.
- C. The specimen shall be tested in accordance with the ANSI A151.1 procedure for the Level "A" doors (1,000,000 cycles).
  - 1. The specimen shall be tested in accordance with the ANSI AI 51.1 procedure for twist test which requires a maximum pressure of 300 lbs. pressure.
- D. All test reports shall include a description of the test specimen, procedures used in testing, and indicate compliance with the acceptance criteria of the test.
- E. Labeled Fire-Rated Doors and Frame Product.
  - 1. Doors, frames, transom frames and sidelight assemblies provided for openings requiring fire, temperature rise, shall be listed and/or classified and bear the label of a testing agency having a factory inspection service. The product shall be tested in accordance with ANSI/NFPA 252 or ANSI/UL-10B, ANSI, UL-10C and constructed as listed or classified for labeling. Fire, temperature rise and/or smoke and draft control ratings shall be determined and scheduled by the Architect.
  - 2. If any door or frame product specified by the Architect to be fire-rated cannot qualify for labeling because of design, hardware or any other reason, the Architect shall be so advised in the submittal documents. If hardware, glazing, or other options affect the fire-rating and are unknown at the time of submittal document preparation, the architect shall be advised.

## 1.9 QUALITY ASSURANCE

- A. Manufacturer's Qualifications.
  - 1. Manufacturer shall provide evidence of having personnel and plant equipment capable of fabricating stainless steel door and frame assemblies of the type specified herein.
- B. Installer Qualifications
  - 1. Installer, trained by the primary product manufacturer, with a minimum of five (5) years documented experience installing stainless steel doors and frame assemblies similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Quality Criteria.

1. All door and frame assemblies shall meet the requirements of Paragraph 1.8 of these specifications.
2. Fire labeled doors and frames shall be provided for those openings requiring fire protection ratings as determined and scheduled by the Architect and as required by the applicable Building Code. Such doors and frames shall be constructed as tested in accordance with ASTM E152 (UL-10B) and approved by Underwriters Laboratories or other recognized testing agencies having a factory inspection service.
3. If any door or frame specified by the Architect to be fire-rated cannot qualify for appropriate labeling because of its design, hardware or any other reason, the Architect shall be so advised before fabricating work on that item is started.
4. Fabrication methods and product quality shall meet the standards set by the Hollow Metal Manufacturers Association, HMMA, a Division of the National Association of Architectural Manufacturers, NAAMM, as set forth in these specifications.

1.10 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:
  1. Elevations of each door type.
  2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
  3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
  4. Locations of reinforcement and preparations for hardware.
  5. Details of each different wall opening condition.
  6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
  7. Details of anchorages, joints, field splices, and connections.
  8. Details of accessories.
  9. Details of moldings, removable stops, and glazing.
- C. Samples for Initial Selection: For stainless steel doors and frames.
  1. Samples for Verification (No work to be fabricated until samples are approved):

2. Finishes: For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches (75 by 127 mm).
  3. Fabrication: Prepare Samples approximately 8 by 10 inches (203 by 254 mm) corner section to demonstrate compliance with requirements for quality of materials and construction:
    - a. Doors: Show vertical-edge including welding joint of head to jamb, top, and bottom construction; core construction; and hinge, hinge mortise and other applied hardware reinforcement. Include separate section showing glazing if applicable with glazing stop applied to both head and jamb section to show corner joint.
    - b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing with stops if applicable.
- D. Product Schedule: For stainless steel doors and frames, show each door and opening, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule – Show hardware group on schedule. Provide one schedule for the entire project – coordinate schedule for doors and openings of materials specified in other sections.

#### 1.11 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of fire-rated stainless steel door and frame assembly, for tests performed by a qualified testing agency.

#### 1.12 DELIVERY, STORAGE, AND HANDLING

- A. Deliver stainless steel doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
  1. Provide additional protection to prevent damage to finished surface of stainless steel units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store stainless steel doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:.

1. Ceco Door; ASSA ABLOY.
2. Curries Company; ASSA ABLOY.
3. Greensteel Industries, Ltd.
4. Steelcraft; an Allegion brand.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than **0.70 deg Btu/F x h x sq. ft.** when tested according to ASTM C 518.

## 2.3 STAINLESS STEEL DOORS AND FRAMES

- A. Stainless Steel Doors (Extra Heavy-Duty, SDI A250.8, Level 3) and Frames (Maximum Heavy-Duty, SDI A250.8, Level 4): NAAMM-HMMA 866; SDI A250.4, Physical Performance Level A. At locations indicated in the Door and Frame Schedule.

1. Doors for Highly Corrosive Environments:
  - a. Type: As indicated in the Door and Frame Schedule.
  - b. Thickness: 1-3/4 inches. Doors shall be neat in appearance and free from warping or buckle. Edge bends shall be true and straight and of minimum radius for the thickness of the metal used.
  - c. Face: Face sheets shall be 0.050 in. (1.27 mm) minimum thickness and shall be manufactured from Type 316 stainless steel sheet. Steel shall be free of scale, pitting, coil breaks or surface blemishes, buckles, waves or other defects.
  - d. Edge Construction: Door face sheets shall be joined at their vertical edges by a continuous weld extending the full height of the door with no visible seams on their faces or vertical edges per HMMA-801-83. Joint shall be set toward the center of the vertical edge of the door. A joint at the corner of the door face and the vertical edge is not accepted. The top and bottom edges shall be closed with a continuous channel, also not less than 0.062"(1.59 mm) thickness, welded to both sheets.
  - e. Edge Profiles: Edge profiles shall be provided on both vertical edges of single acting doors as follows: beveled 1/8" in 1 3/4" profile. All hardware for single acting doors shall be designed for beveled edges as specified.
  - f. Core: The door shall be stiffened by continuous vertically formed steel sections which, upon assembly, shall span the full thickness of the interior space between door faces. These stiffeners shall be 0.030" minimum thickness, spaced so that the vertical interior webs shall be no more than 6" apart and securely fastened to both face sheets by spot welds spaced a maximum of 5" o.c. vertically. Spaces between stiffeners shall be filled with fiberglass, batt-type material.
  - g. Fire-Rated Core: Manufacturer's standard vertical steel stiffener core for fire-rated doors.
  - h. Exposed Finish: No. 6, Dull Satin



2. Frames for Highly Corrosive Environments:

- a. Materials: Type 316 stainless steel sheet. Minimum thickness: In openings 4' - 0" or less, steel shall be 0.062" (1.59 mm) minimum thickness. In openings greater than 4' - 0", steel shall be 0.078" (1.98 mm) minimum thickness.
- b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
- c. Construction: Full profile welded.
  - 1) All frames shall have integral stops and be welded units of the sizes and types shown in the contract drawings.
  - 2) Corner joints shall have all contact edges closed tight with miter faces, and either butted or miter stops. Faces and soffits shall be continuously welded and the faces finished smooth. The use of gussets or splice plates as a substitute for welding shall not be acceptable.
  - 3) All other face joints shall be continuously welded and smoothly finished.
  - 4) Minimum depth of stops shall be  $\frac{5}{8}$ ". Cut-off stops, where shown, shall be capped at heights as shown in the contract drawings, and jamb joints below cut-off stops shall be welded, filled and ground smooth so that there are no visible seams
  - 5) When shipping limitations so dictate, frames for large openings shall be fabricated in sections designated for assembly in the field by others. Alignment plates or angles shall be installed at each joint. Such components shall be the same thickness as the frame. Field joints shall be made in accordance with approved submittal drawings and shall be field welded.

3. Exposed Finish: No. 6, Dull Satin.

2.4 BORROWED LITES

- A. Fabricate frames and removable glazing channel stops from same thickness material as door frames as specified in Section 2.3 A.2.a. above. Stops to be butted at corner joints and secured to the frame using stainless steel #6 countersunk sheet metal screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.
- B. Construction: Full profile welded.
- C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of stainless steel of same or greater thickness as stainless steel frames.
- D. Borrowed lites in fire rated wall enclosures shall be prepared for listed glazing as required in accordance with the stainless steel assembly manufacturer's fire rating procedure.

## 2.5 STAINLESS STEEL INFILL PANELS

- A. Provide stainless steel infill panels of same materials, construction, and finish as adjacent stainless steel door assemblies.

## 2.6 FRAME ANCHORS

- A. Jamb Anchors:

### 1. Masonry Type:

- a. Frames for installation in new masonry walls shall be provided with adjustable jamb anchors of the same material as the frame. Acceptable jamb anchors shall be TEE-strap or strap and stirrup type no less than 0.075" thickness, or wire type no less than 0.185" in diameter. Straps shall be no less than 2" x 10" in size, corrugated and/or perforated. All frames in new masonry shall be filled with grout. The number of anchors provided on each jamb shall be as follows:
  - 1) Frames up to 60" ..., 2 anchors.
  - 2) Frames greater than 60" up to 90" ..., 3 anchors.
  - 3) Frames greater than 90" up to 96" ..., 4 anchors
  - 4) Frames greater than 96", 4 anchors plus 1 for each 24" or fraction thereof over 96" spaced at 24" maximum between anchors (U.L. fire ratings may require additional anchors. Verify building and local code requirements, the most stringent will apply).
- b. Frames for installation in existing masonry or concrete walls shall be prepared for stainless steel expansion bolt type anchors. The preparation shall consist of a countersunk hole for a 3/8" diameter bolt and a spacer from the unexposed surface of the frame to the wall. The spacer shall be welded to the frame and spaced a maximum of 6" from the top and bottom, with intermediate spacing at a maximum of 26" o.c. Fasteners for such anchors shall be stainless steel provided by Installer. All frames installed in exterior openings shall be filled with grout.

### 2. Dry Wall Type:

- a. Frames for installation in stud partitions shall be provided with steel anchors of suitable design, no less than 0.048" thickness, securely welded inside each jamb. The number of anchors provided on each jamb shall be as follows:
  - 1) Frames up to 60" ..., 3 anchors.
  - 2) Frames greater than 60" up to 90" ..., 4 anchors.
  - 3) Frames greater than 90" up to 96" ..., 5 anchors.
  - 4) Frames greater than 96", 5 anchors plus 1 for each 24" or fraction thereof over 96" spaced at 24" maximum between anchors (U.L. fire ratings may require additional anchors. Verify building and local code requirements, the most stringent will apply).

3. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches (610 mm) of frame height above 7 feet (2.1 m).
  4. Post-installed Expansion Anchor: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
1. Floor anchors with two holes for fasteners shall be fastened inside jambs with at least four (4) spot welded per anchor.
  2. Where so scheduled for finish floor underlayment thickness, adjustable floor anchors, providing no less than 2" height adjustment, shall be fastened in place with at least four (4) spot welds per anchor. Terminate bottom of frames at top of underlayment.
  3. Floor anchors shall be of the same material as the frame, with a minimum of 0.078" thickness.
- C. Material: stainless steel sheet – same type as door face.

## 2.7 MATERIALS

- A. Stainless Steel Sheet: ASTM A 240/A 240M, austenitic stainless-steel, Type 316.
- B. Steel Sheet: ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, commercial steel, Type B.
- C. Metallic-Coated Steel Sheet: ASTM A653/A 653M, commercial steel, with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- D. Foam-Plastic Insulation: Manufacturer's standard polystyrene board insulation with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM 84. Enclose insulation completely within door.
- E. Mineral-Fiber Insulation: Insulation made of rock-wool fibers, slag-wool fibers, or glass fibers.
- F. Inserts, Bolts, and Fasteners: Stainless Steel where noted, otherwise, Hot-dip galvanized according to ASTM A 153/A 153M.
- G. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- I. Glazing: Comply with requirements in Section 088000 "Glazing."

- J. Grout: Comply with ASTM C 476, with a slump of not more than 4 inches (102) as measured according to ASTM C 143/C 143M.

## 2.8 FABRICATION

- A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- B. Stainless Steel Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
  - 1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding
  - 2. Provide stainless steel countersunk sheet metal screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner for exposed fasteners unless otherwise indicated.
  - 3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
    - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
  - 4. Terminated Stops: Terminate stops [6 inches (152 mm)] <Insert dimension> above finish floor with a [45] [90]-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.
  - 5. Frames for installation in masonry wall openings more than 4' - 0" in width shall have an angle or channel stiffener made from the same material as the frame that shall be factory welded into the head when the head is to be grouted. Such stiffener shall not be used as lintel or load bearing member, shall not be longer than the opening width but not shorter than 1" and they shall not be less than 0.105" in thickness.
  - 6. Plaster guards shall be provided and welded in place at all hardware mortises on frames to be set in masonry or concrete openings. They shall be made from the same material as the frame with not less than 0.019" thickness.
  - 7. Where specified or scheduled, Stainless Steel Infill Panels will be secured flush to the outside of exterior frames or flush to the secure side of interior frames. The Infill Panels will be anchored to the frame sections with loose stops and moldings on inside or non-secure side of Stainless Steel frames. Provide stops for installation with stainless steel countersunk sheet metal screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

- C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Comply with BHMA A156.115 for preparing stainless steel doors and frames for hardware.
  2. Where non-templated, mortised, and surface-mounted door hardware is to be applied, reinforce doors and frames, with all drilling and tapping done in the field, to receive:
    - a. Minimum thickness for hardware reinforcements in doors as follows:
      - 1) Full mortise hinges and pivots, 0.180".
      - 2) Reinforcements for lock fronts, concealed holders, or surface mounted closer, 0.105".
      - 3) Internal reinforcements for all other surface applied hardware 0.075".
    - b. Minimum thickness for hardware reinforcements in frames as follows:
      - 1) Hinge and pivot reinforcements ..., 0.195" x 1¼" >10" in length.
      - 2) Strike reinforcements ..., 0.105"
      - 3) Closer reinforcements ..., 0.105"
      - 4) Flush bolt reinforcements ..., 0.105"
      - 5) Reinforcements for surface applied hardware ..., 0.105"
      - 6) Reinforcements for hold open arms ..., 0.105"
      - 7) Reinforcements for surface panic devices ..., 0.105"
  3. In cases where electrically operated hardware is required, and indicated on architectural door schedule, conduit, hardware enclosures and/or junction boxes within the door shall be provided. Access plates where required shall be the same thickness as the door and fastened with a minimum of (4) #8-32 Stainless Steel machine screws or #6 Stainless Steel metal screws, not to exceed 12" o.c.
- D. Glazed Lites: Provide stops and moldings around glazed lites where indicated, made of the same material and material thickness as the door or frame. Form corners of stops and moldings with butted hairline joints.
1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated, to secure glazing coordinated in accordance with the glass sizes and thicknesses specified.
  2. Multiple Glazed Lites: Provide welded, fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
  3. Provide fixed frame stops and moldings on outside of exterior and on secure side of interior doors and frames. Fixed glass stops and molding shall be welded to the secure side. Provide loose stops and moldings on inside of hollow-metal doors and frames.
  4. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

5. Provide stops for installation with stainless steel countersunk sheet metal screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.
6. Fire rated doors shall be prepared for listed glazing as required in accordance with the door manufacturer's fire rating procedure.

## 2.9 STAINLESS STEEL FINISHES

- A. Stainless Steel Finishes: Remove tool and die marks and stretch lines, or blend into finish. Grind and polish surfaces to produce uniform finish, free of cross scratches. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- B. Finish: No. 6, Dull Satin.
- C. Grain Direction: For finishes exhibiting grain, run grain vertically on door faces and frame jambs.

## 2.10 LOUVERS

- A. Provide louvers for interior doors, where indicated, which comply with SDI 111, with blades or baffles formed of 0.0480-inch- (1.2-mm-) thick, cold-rolled steel sheet set into 0.053-inch- (1.3-mm-) thick steel frame.
  1. Sightproof Louver: Stationary louvers constructed with welded inverted-V or inverted-Y blades.
  2. Lightproof Louver: Stationary louvers constructed with welded baffles to prevent light from passing from one side to the other.
  3. Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible link, listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated by same qualified testing and inspecting agency that established fire-resistance rating of door assembly. Maximum louver size: 24" x 24" per leaf. Louvers are permitted in the lower portion of door only.
- B. Form corners of moldings with hairline joints. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.

## 2.11 CLEARANCES AND TOLERANCES

- A. Edge clearances for swinging doors shall not exceed the following
  1. Between doors and frames, at head and jambs ..., <sup>3</sup>/<sub>16</sub>".
  2. Between edges of pairs of doors ..., <sup>1</sup>/<sub>16</sub>"

3. At door sills where a threshold is used ...,  $\frac{3}{8}$ ". Measured from bottom of door to top of threshold.
  4. At door sills where no threshold is used ...,  $\frac{3}{4}$ ".
  5. Between door bottom and nominal surface of floor coverings at fire rated openings as provided in NFPA 80-990, Paragraph 2.5.5.
- B. Manufacturing tolerances: Fabricate frames to tolerances indicated in NAAMM-HMMA 866; tolerances shall be maintained within the following limits:
1. Frames for single door or pair of doors:
    - a. Thickness of sheet metal ..., +0.015"; —0.007".
    - b. Width, measured between rabbets at the head. Nominal opening width ..., +  $\frac{1}{16}$ "; —  $\frac{1}{32}$ ".
    - c. Height (total length of jamb rabbet). Nominal opening height ..., +  $\frac{3}{64}$ ".
    - d. Cross sectional profile dimensions.
      - 1) Face ..., +  $\frac{1}{32}$ ".
      - 2) Stop ...,  $\pm \frac{1}{32}$ ".
      - 3) Rabbet ..., +  $\frac{1}{32}$ ".
      - 4) Depth ..., +  $\frac{1}{32}$ ".
      - 5) Throat ...,  $\pm \frac{1}{16}$ ". Frames overlapping walls to have throat dimension  $\frac{1}{8}$ " greater than dimensioned wall thickness to accommodate irregularities in wall construction.
  2. Doors:
    - a. Thickness of sheet metal ... +0.015"; —0.007".
    - b. Width ..., +  $\frac{3}{64}$ "
    - c. Height ..., +  $\frac{3}{64}$ "
    - d. Thickness ..., +  $\frac{1}{16}$ "
    - e. Hardware cutout dimensions. Template dimensions ..., +0.015"; —0"
    - f. Hardware location ..., +  $\frac{1}{32}$ "

## 2.12 HARDWARE LOCATIONS

1. The location of hardware on doors and frames shall be coordinated with the locations indicated in Specification Section 087100 Door Hardware.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Remove wraps or covers from doors and frames upon delivery at the building site. Record any damage or error in the stainless steel doors and frames delivered to the job site, and notify the manufacturer/supplier on writing to maintain warranty and/or fire label
- B. Promptly clean and touch up any scratches or disfigurement caused in shipping or handling.
- C. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Check doors and frames for correct size, swing, fire rating and opening number.
- D. Store door and frame materials in a dry location on planks at least 4" off ground or 2" off floor slab. Doors shall be stored in a vertical position and spaced at least  $\frac{3}{8}$ " by wood strip or blocking. Materials shall be covered to protect them from damage but in such a manner as to permit air circulation. Place no more than 5 doors or welded frames in a group. In the case of multi-opening frames, no more than three units should be stored in a group, to avoid serious racking or other damage to the bottom of the frame
- E. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

### 3.2 INSTALLATION

- A. General: Install stainless steel doors and frames plumb, rigid, properly aligned, and braced securely until permanent anchors are set. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. The installer shall perform the following:
  - 1. Prior to installation, the area of floor on which the frame product is to be installed, and within the path of the door swing, shall be checked for flatness.
  - 2. Prior to installation, all interior surfaces of perimeter frame product sections to be installed in masonry or concrete walls shall be isolated and protected from grout and antifreeze agents.
- C. Doors and frame product shall be checked for correct size, swing, fire rating and opening number. Permissible installation tolerances shall not exceed the following:
  - 1. Squareness,  $\pm 1/16$ " measured on a line, 90 degrees from one jamb, at the upper corner of the frame at the other jamb.
  - 2. Squareness,  $\pm 1/16$ " measured on a line, 90 degrees from one jamb, at the upper corner of the frame at the other jamb.



3. Twist,  $\pm 1/16$ " measured at face corners of jambs on parallel lines perpendicular to the plane of the wall.
  4. Plumbness,  $+1/16$ " measured on the jamb at the floor.
- D. Stainless Steel Frames: Comply with NAAMM-HMMA 840.
1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
    - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
    - b. Install frames with removable stops located on secure side of opening.
  2. Fire-Rated Openings: Install frames according to NFPA 80.
  3. Floor Anchors: Secure with post-installed expansion anchors.
    - a. Floor anchors may be set with power-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.
  4. Hardware must be applied in accordance with hardware manufacturer's templates and instructions.
  5. Plaster guards and junction boxes are intended to protect hardware mortises and tapped mounting holes from masonry grout of 4" maximum slump consistency which is hand troweled in place. If a light consistency grout (greater than 5" slump when tested in accordance with ASTM C 143/C 143M) is to be used, special precautions must be taken in the field by the installation contractor to protect the aforementioned.
  6. Frame products are not intended or designed to act as forms for grout or concrete. Grouting of hollow metal sections shall be done in "lifts" or precautions shall be otherwise taken by the contractor to ensure that frames are not deformed or damaged by the hydraulic forces that occur during this process.
  7. Any grout or other bonding material shall be promptly cleaned off of frames or doors following installation. Hollow metal surfaces shall be kept free of grout, tar, or other bonding material or sealer.
  8. 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.
  9. Exposed hollow metal surfaces which have been scratched or otherwise marred during installation, cleaning, and/or field welding, shall promptly be finished smooth, cleaned, treated for maximum paint adhesion and touched up with a rust inhibitive primer comparable to and compatible with the shop applied primer and finish paint specified in Section 099000.

- E. stainless steel Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
  - 1. Non-Fire-Rated Steel Doors: Comply with NAAMM-HMMA 841 and NAAMM-HMMA guide specification indicated.
  - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
  - 3. Smoke-Control Doors: Install doors according to NFPA 105.
- F. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with stainless steel manufacturer's written instructions.

### 3.3 ADJUSTING AND CLEANING

- A. Clean grout and other bonding material off stainless steel doors and frames immediately after installation.
- B. Stainless Steel Touchup: Immediately after erection, smooth any scratched or damaged areas of stainless steel; polish to match undamaged finish.

END OF SECTION 081119

**SECTION 083323**  
**OVERHEAD COILING DOORS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section includes:
  - 1. Service doors.
- B. Related Section:
  - 1. Section 055000 "Metal Fabrications" for miscellaneous steel supports.

**1.2 PERFORMANCE REQUIREMENTS**

- A. Structural Performance, Exterior Doors: Exterior overhead coiling doors shall withstand the wind loads, the effects of gravity loads, and loads and stresses within limits and under conditions indicated according to SEI/ASCE 7.
  - 1. Wind Loads: Uniform pressure (velocity pressure) of 20 lbf/sq. ft., acting inward and outward.
- B. Windborne-Debris-Impact-Resistance Performance: Provide impact-protective overhead coiling doors that pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and ASTM E 1996.
  - 1. Large Missile Test: For overhead coiling doors located within 30 feet of grade.
- C. Seismic Performance: Overhead coiling doors shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

**1.3 ACTION SUBMITTALS**

- A. Product Data: For each type and size of overhead coiling door and accessory.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, 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.

- C. Samples: For each exposed product and for each color and texture specified.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For overhead coiling doors, accessories, and components, from manufacturer.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.

### PART 2 - PRODUCTS

#### 2.1 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

- 1. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face.

- B. Bottom Bar for Service Doors: Consisting of two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; fabricated from metal to match curtain slats and finish.

- C. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

- 1. Removable Posts and Jamb Guides for Counter Doors: Manufacturer's standard.

#### 2.2 HOOD

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Exterior-Mounted Doors: Fabricate hood to act as weather protection and with a perimeter sealant-joint-bead profile for applying joint sealant.

## 2.3 LOCKING DEVICES

- A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.
- B. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
  1. Lock Cylinders: Provide cylinders standard with manufacturer and keyed to building keying system.
  2. Keys: Provide three for each cylinder.
- C. Chain Lock Keeper: Suitable for padlock.

## 2.4 CURTAIN ACCESSORIES

- A. Push/Pull Handles: Equip each push-up-operated with lifting handles on each side of door, finished to match door. Provide pull-down straps or pole hooks for doors more than 84 inches high.

## 2.5 COUNTERBALANCING MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

## 2.6 MANUAL DOOR OPERATORS

- A. Equip door with manufacturer's recommended manual door operator unless another type of door operator is indicated.
- B. Push-up Door Operation: Design counterbalance mechanism so required lift or pull for door operation does not exceed 25 lbf.

## 2.7 DOOR ASSEMBLY

- A. Service Door: Overhead coiling door formed with curtain of interlocking metal slats.

1. 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. [ACME Rolling Doors.](#)
  - b. [Alpine Overhead Doors, Inc.](#)
  - c. [AlumaTek, Inc.](#)
  - d. [C.H.I. Overhead Doors.](#)
  - e. [City-Gates.](#)
  - f. [Cookson Company.](#)
  - g. [Cornell Iron Works, Inc.](#)
  - h. [Dynamic Closures Corp.](#)
  - i. [Lawrence Roll-Up Doors, Inc.](#)
  - j. [Mahon Door Corporation.](#)
  - k. [McKeon Rolling Steel Door Company, Inc.](#)
  - l. [Metro Door.](#)
  - m. [Overhead Door Corporation.](#)
  - n. [QMI Security Solutions.](#)
  - o. [Raynor.](#)
  - p. [Southwestern Steel Rolling Door Co.](#)
  - q. [Wayne-Dalton Corp.](#)
  - r. [Windsor Door.](#)
- B. Operation Cycles: Not less than 50,000.
- C. Door Curtain Material: Galvanized steel.
- D. Door Curtain Slats: Flat profile slats of 2-5/8-inch center-to-center height.
- E. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.
- F. Hood: Galvanized steel.
  1. Shape: Square with beveled front edges.
  2. Mounting: Face of wall.
- G. Locking Devices: Equip door with slide bolt for padlock and chain lock keeper.
  1. Locking Device Assembly: Single-jamb side locking bars, operable from outside only, with cylinder.
- H. Manual Door Operator: Push-up operation.
- I. Door Finish:
  1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.

2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Fire-Rated Doors: Install according to NFPA 80.
- C. Smoke-Control Doors: Install according to NFPA 80 and NFPA 105.
- D. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion. Lubricate bearings and sliding parts as recommended by manufacturer.

#### 3.2 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 083323

## SECTION 084113

### ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Interior storefront framing.
2. Exterior manual-swing entrance doors.

##### 1.2 PERFORMANCE REQUIREMENTS

###### A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
2. Dimensional tolerances of building frame and other adjacent construction.
3. Failure includes the following:
  - a. Deflection exceeding specified limits.
  - b. Thermal stresses transferring to building structure.
  - c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
  - d. Noise or vibration created by wind and by thermal and structural movements.
  - e. Loosening or weakening of fasteners, attachments, and other components.
  - f. Failure of operating units.

###### B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated. Engineer must be licensed / registered in the State of Pennsylvania.

###### C. Wind Loads: As indicated on Drawings.

###### D. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed  $L/175$  of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to  $L/360$  of clear span or 1/8 inch, whichever is smaller.



- E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:
  - 1. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
  - 2. Test Durations: 10 seconds.
- F. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft.
- G. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
- C. Samples: For each type of exposed finish required.
- D. Other Action Submittals:
  - 1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams.
- A. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Engineer must be licensed / registered in the State of Pennsylvania.

### 1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Field quality-control reports.
- C. Warranties: Sample of special warranties.

## 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.
- C. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.
- D. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
- E. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.
- F. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.
- G. Preinstallation Conference: Conduct conference at Project site.

## 1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.
  - 1. Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer North America; an Alcoa company; Trifab 451T Series Storefront Framing or comparable product by one of the following:
  - 1. Wausau Window and Wall Systems.
  - 2. YKK AP America Inc.

### MATERIALS

- C. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
  - 1. Sheet and Plate: ASTM B 209.
  - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
  - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
  - 4. Structural Profiles: ASTM B 308/B 308M.
  - 5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
- D. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
  - 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
  - 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
  - 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

### 2.2 FRAMING SYSTEMS

- A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
  - 1. Construction: Thermally broken.
  - 2. Glazing System: Retained mechanically with gaskets on four sides.
  - 3. Glazing Plane: Exterior systems; toward exterior, Interior systems; at center.
- B. Framing Dimensions: 2" x 4 ½" (Front Set)
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

- D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
  - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
  - 2. Reinforce members as required to receive fastener threads.
  - 3. Use exposed fasteners with countersunk Phillips screw heads, fabricated from stainless steel.
- E. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.
- F. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- G. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.
  - 1. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

## 2.3 GLAZING SYSTEMS

- A. Glazing: As specified in Section 088000 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

## 2.4 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
  - 1. Basis-of-Design System: Kawneer AA425.
  - 2. Door Construction: 2-inch overall thickness, with minimum 0.188-inch-thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
    - a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.

3. Door Design: Wide stile; 4-inch nominal width vertical and top rails, 10-inch nominal bottom rail option.
    - a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.
  4. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.
    - a. Provide nonremovable glazing stops on outside of door.
- B. Entrance Door Hardware: As specified in Section 087100 "Door Hardware."

## 2.5 ENTRANCE DOOR HARDWARE

- A. Basis-of-Design System: Kawneer AA425.
- B. General: Provide entrance door hardware **and entrance door hardware sets indicated in door and frame** schedule and entrance door hardware sets indicated in Section 087111 "Door Hardware" for each entrance door to comply with requirements in this Section.
1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products equivalent in function and comparable in quality to named products and products complying with BHMA standard referenced.
  2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
  3. Opening-Force Requirements:
    - a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbf to set the door in motion and not more than 15 lbf to open the door to its minimum required width.
    - b. Accessible Interior Doors: Not more than 5 lbf to fully open door.
- C. Opening-Force Requirements:
1. Delayed-Egress Locks: Lock releases within 15 seconds after applying a force of not more than 15 lbf for not more than 3 seconds.
  2. Latches and Exit Devices: Not more than 15 lbf required to release latch.
- D. Pivot Hinges: BHMA A156.4, Grade 1.
1. Offset-Pivot Hinges: Provide top, bottom, and intermediate offset pivots at each door leaf.
- E. Butt Hinges: BHMA A156.1, Grade 1, radius corner.
1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while entrance door is closed.
  2. Exterior Hinges: Stainless steel, with stainless-steel pin

3. Quantities:
  - a. Provide 3 hinges per leaf.
- F. Continuous-Gear Hinges: Manufacturer's standard with stainless-steel bearings between knuckles, fabricated to full height of door and frame.
- G. Mortise Auxiliary Locks: BHMA A156.5, Grade 1.
- H. Manual Flush Bolts: BHMA A156.16, Grade 1.
- I. Automatic and Self-Latching Flush Bolts: BHMA A156.3, Grade 1.
- J. Panic Exit Devices: BHMA A156.3, Grade 1, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- K. Cylinders: **As** specified in Section 087100 "Door Hardware."
  1. Keying: Master key system. Permanently inscribe each key with a visual key control number and include notation "DO NOT DUPLICATE".
- L. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.
- M. Operating Trim: BHMA A156.6.
- N. Removable Mullions: BHMA A156.3, extruded aluminum.
  1. When used with panic exit devices, provide removable mullions listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305. Use only mullions that have been tested with exit devices to be used.
- O. Closers: BHMA A156.4, Grade 1, with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to meet field conditions and requirements for opening force.
- P. Concealed Overhead Holders: BHMA A156.8, Grade 1.
- Q. Surface-Mounted Holders: BHMA A156.16, Grade 1.
- R. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.
- S. Weather Stripping: Manufacturer's standard replaceable components.
- T. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- U. Silencers: BHMA A156.16, Grade 1.

- V. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.
- W. Finger Guards: Manufacturer's standard collapsible neoprene or PVC gasket anchored to frame hinge-jamb at center-pivoted doors.

## 2.6 ACCESSORY MATERIALS

- A. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

## 2.7 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
  - 1. Profiles that are sharp, straight, and free of defects or deformations.
  - 2. Accurately fitted joints with ends coped or mitered.
  - 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
  - 4. Physical and thermal isolation of glazing from framing members.
  - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
  - 6. Provisions for field replacement of glazing from interior.
  - 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
- F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
- G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

## 2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
- B. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
  - 1. Color: As selected by Architect from full range of industry colors and color densities.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General:
  - 1. Comply with manufacturer's written instructions.
  - 2. Do not install damaged components.
  - 3. Fit joints to produce hairline joints free of burrs and distortion.
  - 4. Rigidly secure nonmovement joints.
  - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
  - 6. Seal joints watertight unless otherwise indicated.
- B. Metal Protection:
  - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
  - 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
- D. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.
- E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.
- F. Install glazing as specified in Section 088000 "Glazing."
- G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
  - 1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
  - 2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.



### 3.2 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections.
- B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.
  - 1. Water Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
    - a. Test Area: Exterior entry door assembly.
- C. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- E. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.

END OF SECTION 084113

**SECTION 085113**  
**ALUMINUM WINDOWS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section includes aluminum windows for exterior locations.

**1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- C. Samples: For each exposed product and for each color specified, 2 by 4 inches in size.
- D. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

**1.3 INFORMATIONAL SUBMITTALS**

- A. Product test reports.
- B. Sample warranties.

**1.4 QUALITY ASSURANCE**

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

**1.5 WARRANTY**

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period:
    - a. Window: 10 years from date of Substantial Completion.
    - b. Glazing Units: 20 years from date of Substantial Completion.
    - c. Aluminum Finish: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer North America; an Alcoa company; Trifab 451T Series Storefront Framing or comparable product by one of the following:
  - 1. Wausau Window and Wall Systems.
  - 2. YKK AP America Inc.

### 2.2 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: AAMA/WDMA/CSA 101/I.S.2/A440.
  - 1. Minimum Performance Class: LC.
  - 2. Minimum Performance Grade: 25.
- B. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.45 Btu/sq. ft. x h x deg F.
- C. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.40.
- D. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 52.

### 2.3 ALUMINUM WINDOWS

- A. Operating Types: Fixed.
- B. Frames and Sashes: Thermally broken aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.
- C. Framing Dimensions: 2" x 4 1/2" (Front Set)
- D. Glass: Clear annealed glass, ASTM C 1036, Type 1, Class 1, q3.
  - 1. Kind: Fully tempered.
- E. Insulating-Glass Units: ASTM E 2190.
  - 1. Glass: ASTM C 1036, Type 1, Class 1, q3.
    - a. Tint: Clear.
    - b. Kind: Fully tempered.

2. Lites: Two.
  3. Filling: Fill space between glass lites with air.
  4. Low-E Coating: Pyrolytic on second surface.
- F. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.
- G. Hardware, General: Manufacturer's standard corrosion-resistant hardware sized to accommodate sash weight and dimensions.
1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.
- H. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
- I. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
1. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

## 2.4 ACCESSORIES

- A. Subsills: Thermally broken, extruded-aluminum subsills in configurations indicated on Drawings.
- B. Interior Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.
- C. Receptor System: Two-piece, snap-together, thermally broken, extruded-aluminum receptor system that anchors windows in place.

## 2.5 FABRICATION

- A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
- B. Glaze aluminum windows in the factory.
- C. Weather strip each operable sash to provide weathertight installation.
- D. Provide weep holes and internal passages to conduct infiltrating water to exterior.
- E. Provide water-shed members above side-hinged sashes and similar lines of natural water penetration.
- F. Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for

movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design wind loads of window units.

- G. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

## 2.6 ALUMINUM FINISHES

- A. Anodic Finish: Class I complying with AAMA 611.
  - 1. Color: Coordinate with exterior elevations. Aluminum windows to match typical PNT-8 metal paint finish.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
- E. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- F. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- G. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 085113

## SECTION 088113

### DECORATIVE GLASS GLAZING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes the following decorative glass for interior applications:

1. Glass decorative film overlay.

##### 1.2 DEFINITION

- A. Glass Thickness: Indicated by thickness designations in millimeters according to ASTM C 1036.

##### 1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed glazing systems shall withstand normal thermal movement and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; deterioration of glazing materials; or other defects in construction.

##### 1.4 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants. Data based on previous testing of current sealant products, and glazing materials matching those specified is acceptable.

##### 1.5 ACTION SUBMITTALS

- A. Product Data: For each decorative-glass and glazing product indicated.
- B. Shop Drawings: For decorative glass. Show fabrication and installation details.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Product Schedule: For decorative glass.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Product certificates.
- B. Preconstruction adhesion and compatibility test reports.
- C. Warranty: Sample of special warranty.

## 1.7 CLOSEOUT SUBMITTALS

- A. Maintenance data.

## 1.8 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under NGA's Certified Glass Installer Program.
- B. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- C. Glazing Publications: Comply with published recommendations in GANA's "Glazing Manual" unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
- D. Safety Glazing: Where safety glazing is indicated, comply with testing requirements in 16 CFR 1201 for Category II materials.

## PART 2 - PRODUCTS

### 2.1 DECORATIVE GLASS TYPES

- A. Decorative Glass: Glass with decorative film overlay. Use translucent, dimensionally stable, cast PVC film, 2-mil-minimum thickness, with pressure-sensitive, clear adhesive back for adhering to glass and releasable protective backing.
  - 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. [Avery Dennison, Graphics; Etchmark A5861-S.](#)
    - b. [FDC Graphic Films, Inc.](#); Intermediate Frosted Crystal Vinyl Film Series 3804, Silver
    - c. [FDC Graphic Films, Inc.; Premium Frosted Etched Glass Vinyl Film Series 3500.](#)
    - d. [3M; Scotchcal Dusted Crystal.](#)
    - e. [3M; Scotchcal Frosted Crystal, Clear.](#)
  - 2. Glass Type: Existing.
  - 3. Glass Thickness: Existing

4. Comply with requirements for safety glazing.
5. Patterns: As selected by Architect from manufacturer's full range.

## 2.2 DECORATIVE-GLASS FABRICATION

- A. Decorative Film Overlay: Apply squarely aligned to glass edges, uniformly smooth, and free from tears, air bubbles, wrinkles, and rough edges, in single sheet completely overlaying the back face of clean glass, according to manufacturer's written instructions, including surface preparation and application temperature limitations.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Examine decorative-glass framing members, with Installer present, for compliance with the following:
  1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
  2. Minimum required face or edge clearances.
  3. Effective sealing between joints of decorative-glass framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Set decorative-glass units in each series true in line with uniform orientation, pattern, draw, bow, and similar characteristics.
- D. Set glass lites with proper orientation so that each outer surface faces the direction indicated on Drawings.
- E. Set decorative glass in locations indicated on Drawings. Install glass with hardware and accessories according to hardware manufacturer's written instructions. Attach hardware securely to mounting surfaces.
- F. Decorative Glass: Install glazing as specified in Section 088000 "Glazing."
- G. Protect decorative glass from damage immediately after installation by attaching crossed streamers to framing and held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- H. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- I. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.



END OF SECTION 088113

PROJECT NO. 16640E-01-02  
088113-4  
DECORATIVE GLASS GLAZING

**SECTION 087111  
DOOR HARDWARE**

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. Mechanical door hardware for the following:
  - a. Swinging doors.
  - b. Other doors to the extent indicated.
2. Cylinders for door hardware specified in other Sections.
3. Electrified door hardware.

B. Related Requirements:

1. Section 081113 "Hollow Metal Doors and Frames".
2. Section 081119 "Stainless-Steel Doors and Frames".
3. Section 084113 "Aluminum-Framed Entrances and Storefronts" for entrance door hardware, except cylinders.
4. Section 087113 "Automatic Door Operators" for low-energy power operators and low-energy power-assist operators.

- C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.

1. Permanent cylinders cores and keys to be furnished and installed by *Philadelphia Parks and Recreation Department*.

1.3 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to

source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

- C. Door and Frame Preparation: Related Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.
- D. Provide removal schedule of the lock cylinders and cores. Coordinate delivery of the salvaged items with the project coordinator. All items not delivered shall be replaced with new.
- E. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

#### 1.4 PRE-SUBMITTAL CONFERENCE:

- A. Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
  - 1. Prior to installation of door hardware, arrange for manufacturers' representatives to hold a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for all doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
  - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
  - 3. Review sequence of operation narratives for each unique access controlled opening.
  - 4. Review and finalize construction schedule and verify availability of materials.
  - 5. Review the required inspecting, testing, commissioning, and demonstration procedures.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For electrified door hardware.
  - 1. Include diagrams for power, signal, and control wiring.
  - 2. Include details of interface of electrified door hardware and building safety and security systems.

- C. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
  2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.
    - a. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
  3. Content: Include the following information:
    - a. Type, style, function, size, label, hand, and finish of each door hardware item.
    - b. Manufacturer of each item.
    - c. Fastenings and other pertinent information.
    - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    - e. Explanation of abbreviations, symbols, and codes contained in schedule.
    - f. Mounting locations for door hardware.
    - g. Door and frame sizes and materials.
  4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- D. System Operational Descriptions: Complete system operational narratives for the access controlled openings defining the *Philadelphia Parks and Recreation Department's* prescribed requirements for the opening functionality. Narratives include, but are not limited to, the following situations: normal secured/unsecured state of door; authorized access; authorized egress; unauthorized access; unauthorized egress; fire alarm and loss of power conditions, and interfaces with other building control systems.
- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.
- F. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.
- G. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing *Philadelphia Parks and Recreation Department's* final keying instructions

for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

## 1.6 INFORMATIONAL SUBMITTALS

Coordinate "Qualification Data" Paragraph below with qualification requirements in Section 014000 "Quality Requirements" and as may be supplemented in "Quality Assurance" Article.

- A. Qualification Data: For Installer and Architectural Hardware Consultant.

Retain "Product Certificates" Paragraph below to require submittal of product certificates from electrified door hardware manufacturers.

- B. Product Certificates: For each type of electrified door hardware.
  - 1. Certify that door hardware for use on each type and size of labeled fire-rated doors complies with listed fire-rated door assemblies.

Retain "Product Test Reports" Paragraph below if retaining "Accessibility Requirements" Paragraph in "Performance Requirements" Article.

- C. Product Test Reports: For compliance with accessibility requirements, for tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.

Retain "Field quality-control reports" Paragraph below if Contractor is responsible for field quality-control inspecting.

- D. Field quality-control reports.

## 1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals.
- B. Schedules: Final door hardware and keying schedule.

## 1.8 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum [5] years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Installer Qualifications: Installers, trained by the primary product manufacturers, with a minimum [3] years documented experience installing both standard and electrified builders hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

- C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum [5] years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor in good standing by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and the *Philadelphia Parks and Recreation Department* concerning both standard and electromechanical door hardware and keying.

- 1. Scheduling Responsibility: Preparation of door hardware schedules.

#### 1.9 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Division 1 - Closeout Procedures.
- B. Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

#### 1.10 QUALIFICATIONS

- A. Manufacturers: Companies specializing in the manufacture of products specified in this Section with minimum five years experience.
- B. Hardware Supplier: Company specializing in supplying commercial door hardware with minimum five years experience.

#### 1.11 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

#### 1.12 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive PPR of other rights PPR may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship

within specified warranty period after final acceptance by the *Philadelphia Parks and Recreation Department*. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
  2. Faulty operation of the hardware.
  3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods (Door Hardware):
1. Ten years for mortise locks and latches.
  2. Five years for exit hardware.
  3. Ten years for manual door closers.

#### 1.13 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for *Philadelphia Parks and Recreation Department* 's continued adjustment, maintenance, and removal and replacement of door hardware.

#### 1.14 SEQUENCING AND SCHEDULING

- A. Coordinate work of this Section with other directly affected Sections involving manufacturer of any internal reinforcement for door hardware.
- B. Furnish hardware templates to frame and door manufacturers for installation of hardware.
- C. Provide removal's schedule of the lock's cylinder and cores. Coordinate delivery of the salvaged items with the department's Architect/Engineer. All items not delivered shall be replaced with new.

SPECIAL NOTE: All removal of the existing lock's cylinder and cores must be carefully done and set aside for the Department's disposition.

- D. Package lock's cylinder and cores individually label and identify package with door opening code to match Hardware Schedule.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

	Item	Manufacturer	Comments
A.	Hinges	Markar & Stanley	

B.	Locksets, Cylinders and Cores	Best
C.	Pull/Pull Plates	Rockwood
D.	Kick Plates	Rockwood
E.	Armor Plates	Rockwood
F.	Closers	LCN
G.	Thresholds	Reese & Pemko
H.	Door Stops/Wall Bumpers	IVES & Rockwood
I.	Exit Devices	Monarch
J.	Weatherstripping	Reese & Pemko
K.	Keying Control System	Best
L.	Remote Annunciator Panel	Detex
M.	Magnetic Switch	GRI
N.	Security Astragal, "TEE" Type	Markar
O.	Surface Bolts	IVES
P.	Padlocks	Best of Wilsom Bohannan
Q.	Overhead Holder	LCN
R.	Lock Guards	Markar
S.	Removable Mullion (interior only)	Monarch
T.	Substitutions under the provisions of Section 012513.	

## 2.2 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the model building code including, but not limited to, the following:
1. NFPA 70 "National Electrical Code", including electrical components, devices, and accessories listed and labeled as defined in Article 100 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.



2. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1 as follows:
  - a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
  - b. Door Closers: Comply with the following maximum opening-force requirements indicated:
    - 1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
    - 2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
  - c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.
3. NFPA 101: Comply with the following for means of egress doors:
  - a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
  - b. Thresholds: Not more than 1/2 inch high.
4. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252 (neutral pressure at 40" above sill) or UL-10C.
  - a. Test Pressure: Positive pressure labeling.

Retain "Smoke- and Draft-Control Door Assemblies" Paragraph below if required. The International Building Code requires fire door assemblies to comply with smoke- and draft-control requirements in corridors, smoke barriers, and smoke partitions.

- B. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that complies with requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
  1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch wg of water.

## 2.3 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this Section and the Door Hardware Sets at the end of Part 3.
  1. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware

Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

- a. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements.
- b. The following is a list of the Basis of Design Manufacturers:

<u>Item</u>	<u>Manufacturer</u>	<u>Comments</u>
Hinges	Markar & Stanley	
Locksets, Cylinders and Cores	Best	
Pull/Pull Plates	Rockwood	
Kick Plates	Rockwood	
Armor Plates	Rockwood	
Closers	LCN	
Thresholds	Reese & Pemko	
Door Stops/Wall Bumpers	IVES & Rockwood	
Exit Devices	Monarch	
Weatherstripping	Reese & Pemko	
Keying Control System	Best	
Remote Annunciator Panel	Detex	
Magnetic Switch	GRI	
Security Astragal, "TEE" Type	Markar	
Surface Bolts	IVES	
Padlocks	Best of Wilsom Bohannan	
Overhead Holder	LCN	
Lock Guards	Markar	
Removable Mullion (interior only)	Monarch	
Substitutions		

2. Substitutions to the Basis of Design list of Manufacturers:

- a. Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, the *Philadelphia Parks and Recreation Department*, and their designated consultants.

2.4 HINGES

A. Manufacturers: Basis of Design provide products by Markar & Stanley

- 1. Subject to compliance with requirements, products by one of the following manufacturers may be submitted under the provisions of Division 01, Substitution Procedures.

- a. Butt Hinges:
  - 1) Bommer Industries.
  - 2) Hager Companies.
  - 3) McKinney Products.
- b. Continuous Barrel Hinges:
  - 1) Bommer Industries.
  - 2) McKinney Products.
  - 3) Pemko Manufacturing.

B. Standards: Certified products complying with the following:

- 1. Butts and Hinges: ANSI/BHMA A156.1.
- 2. Continuous Barrel Hinges: ANSI/BHMA A156.26.
- 3. Template Hinge Dimensions: ANSI/BHMA A156.7.

C. Quantity: Provide the following hinge quantity, unless otherwise indicated:

- 1. Two Hinges: For doors with heights up to 60 inches.
- 2. Three Hinges: For doors with heights 61 to 90 inches.
- 3. Four Hinges: For doors with heights 91 to 120 inches.
- 4. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

D. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

Maximum Door Size (inches)	Hinge Height (inches)	Metal Thickness (inches)	
		Standard Weight	Heavy Weight
Up to 48-in by 120-in by 1-3/4	4-1/2	0.134	0.180
48-in by up to 120-in by 1-3/4	5	n/a	0.190

- E. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
  - 1. Exterior Doors: Heavy weight, stainless steel barrel type hinge
  - 2. Interior Doors: Standard weight, steel, ball bearing hinges unless Hardware Sets indicate heavy weight.
  
- F. Hinge Options: Comply with the following where indicated in the Hardware Sets or on Drawings:
  - 1. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:
    - a. Out-swinging access controlled doors.
  
- G. At Aluminum Entrances and Storefronts: Continuous-Geared Hinges: Minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves with a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Provide concealed flush mount (with or without inset), full surface, and half surface, in standard and heavy duty models, as specified in the door hardware sets. Concealed continuous hinges to be U.L. listed for use on up to and including 90 minute rated door installations. Factory cut hinges for door size and provide with removable service power transfer panel where indicated at electrified openings.

## 2.5 DOOR OPERATING TRIM

- A. Manufacturers: Basis of Design provide products by Best
  - 1. Subject to compliance with requirements, products by one of the following manufacturers may be submitted under the provisions of Division 01, Substitution Procedures.
    - a. Surface Bolts and Flushbolts:
      - 1) Door Controls International.
      - 2) McKinney Products.
      - 3) Rockwood Manufacturing.
  - 2. Standards: Comply with the following:
    - a. Surface Bolts: BHMA A156.16.
    - b. Automatic and Self-Latching Flush Bolts: BHMA A156.3.
    - c. Manual Flush Bolts: BHMA A156.16.
  - 3. Surface Bolts and Flush Bolts: BHMA Certified Grade 1.
  - 4. Provide manual flush bolts with top rod of sufficient length to allow bolt location approximately six feet from the floor. Furnish dust proof strikes for bottom bolts. Surface bolts to be 8" in length and U.L. listed for labeled fire doors.
  - 5. Bolt Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:
    - a. Mortise Flush Bolts: Minimum 3/4-inch throw.

## 2.6 LOCKS AND LATCHES

- A. Manufacturers: Basis of Design provide products by Monarch
  - 1. Subject to compliance with requirements, products by one of the following manufacturers may be submitted under the provisions of Division 01, Substitution Procedures.
    - a. Mechanical Mortise Locks and Latches:
      - 1) Corbin Russwin Hardware - ML2000 Series.
      - 2) Sargent Manufacturing - 8200 Series.
      - 3) Schlage - L9000 Series
- B. Standards: Comply with the following:
  - 1. Mortise Locks and Latches: BHMA A156.13, Certified Grade 1, Series 1000.
- C. Lock Trim: Match the following design style:
  - 1. Levers:
    - a. Monarch Falcon – SUTRO design.
- D. Lock Functions: Function numbers and descriptions indicated in the Door Hardware Schedule comply with the following:
  - 1. Mortise Locks: BHMA A156.13.
- E. Lock Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:
  - 1. Mortise Locks: Minimum 3/4-inch latchbolt throw.
- F. Backset: 2-3/4 inches unless otherwise indicated.

## 2.7 CYLINDERS AND KEYING

- A. Basis of Design Manufacturer: Subject to compliance with requirements, provide products by Best.
- B. Standards: Comply with the following:
  - 1. Cylinders: BHMA A156.5 Certified Grade 1.
- C. Cylinders: Cylinders complying with the following:
  - 1. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
  - 2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
  - 3. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.

- D. Construction Master keying: Furnish construction master keyed cylinders or temporary keyed construction cores where specified.
  - 1. General Contractor to provide permanent cores to Philadelphia Parks & Recreation.
- E. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.

Retain paragraph above if permanent cores will be installed during construction. Retain paragraph below if temporary construction cores are required.

- F. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.
- G. Key Control System: Provide lockable cabinet for key control and storage as indicated in Hardware Sets.
- H. All door locks shall be master keyed to the PPR's master keying system incorporating completely removable and interchangeable cylinder cores. The interchangeable cores shall be removable by a special control key.
- I. Furnish construction cores during the period of construction using only construction keys. Upon date established by the Architect or Engineer, void construction core system and install specified keying system.
- J. All lock shall be grand master keyed and master keyed to the specifications of the *Philadelphia Parks and Recreation Department*. All permanent cores, shall be installed seven (7) days before the final inspection. All their keys, shall be shipped directly from the manufacturer to the *Philadelphia Parks and Recreation Department* only. All locks shall be supplied to the contractor with temporary construction cores for use by the contractor during the construction period.
- K. All mortise lock-sets shall be of heavy duty series and shall meet ANSI A156 Series 1000, Grade 1 operational and Grade 1 security.
- L. Locks must be supplied with cores and keys to match existing system.
- M. The master key system where required shall be a factory registered system to insure the propriety of the codes and avoid duplication or cross-keying.
- N. Provide ten extra keyed interchangeable cores for each master keyed group.
- O. Lock-sets and latch-sets shall be heavy duty mortise type with hinged, antifriction,  $\frac{3}{4}$  inch throw latch-bolt with antifriction piece made of self lubricating stainless steel. The lock body cover will have five screw fasteners. Functions and design as indicated in the hardware groups. Functions shall be one inch projection with two hardened steel roll pins and concealed mounting.
- P. Permanent keys and cores will be stamped with the applicable key mark for identification. Mark the side of every core with the key mark.
- Q. Lock-sets and cores to be of the same manufacturer to maintain complete lock-set warranty.

- R. Deadbolts shall have no exposed mounting screws. Screws shall be covered by the trim plate that shall be detachable only after the core is removed.
- S. All cores shall be high security type, Best® #5C7DD. They shall be removable from all lock-sets by Special Control Key. Also, the removable core must be instantly interchangeable without modification for use in any lock throughout this system.
- T. Furnish two individual keys for each lock.
- U. Furnish keys (for each building) in the following quantities:
  - 1. 6 master keys.
  - 2. 2 control keys.
  - 3. 2 construction keys.
  - 4. 2 Individual keys for each.
  - 5. 2 Grandmaster keys.

## 2.8 STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
  - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
  - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
  - 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
- B. Standards: Comply with the following:
  - 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
  - 2. Dustproof Strikes: BHMA A156.16.

## 2.9 EXIT DEVICES

- A. Manufacturers: Basis of Design provide products by Monarch
  - 1. Subject to compliance with requirements, products by one of the following manufacturers may be submitted under the provisions of Division 01, Substitution Procedures.
    - a. Corbin Russwin Hardware - ED4000/ED5000 Series.
    - b. Sargent Manufacturing - 80 Series.
    - c. Von Duprin - 35A/98 Series.
- B. Standard: BHMA A156.3, Certified Grade 1.
- C. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

- D. Fire Exit Devices: Complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.
- E. Outside Trim: Match design for locksets and latchsets, unless otherwise indicated.
- F. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

## 2.10 ACCESSORIES FOR PAIRS OF DOORS

- A. Manufacturers: Basis of Design provide products by Monarch
  - 1. Subject to compliance with requirements, products by one of the following manufacturers may be submitted under the provisions of Division 01, Substitution Procedures.
  - 2. Keyed Removable Mullions:
    - a. Corbin Russwin Hardware.
    - b. Sargent Manufacturing.
    - c. Von Duprin.
- B. Standards: Comply with the following:
  - 1. Coordinators: BHMA A156.3.
  - 2. Removable Mullions: BHMA A156.3.
- C. Fire-Exit Removable Mullions: Provide keyed removable mullions for use with fire exit devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252. Mullions shall be used only with exit devices for which they have been tested.

## 2.11 CLOSERS

- A. Manufacturers: Basis of Design provide products by LCN
  - 1. Subject to compliance with requirements, products by one of the following manufacturers may be submitted under the provisions of Division 01, Substitution Procedures.
  - 2. Surface-Mounted Closers (Heavy Duty):
    - a. Corbin Russwin Hardware - DC8000 Series with heavy duty arms.
    - b. Norton Door Controls - 7500 Series with heavy duty arms.
    - c. Sargent Manufacturing - 351 Series with heavy duty arms.
- B. Standards: Comply with the following:
  - 1. Surface Closers: BHMA A156.4, Certified Grade 1.



- C. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide non-handed, factory-sized closers adjustable to meet field conditions and requirements for opening force.
- D. Closer Options: As indicated in hardware sets, provide door closer options including: delayed action, hold open arms, extra duty parallel arms, positive stop/hold open arms, compression stop/hold open arms, special mounting brackets, spacers and drop plates. Through bolt type mounting is required as indicated in the door hardware sets.

## 2.12 OPERATING AND PROTECTIVE TRIM UNITS

- A. Manufacturers: Basis of Design provide products by Rockwood
  - 1. Subject to compliance with requirements, products by one of the following manufacturers may be submitted under the provisions of Division 01, Substitution Procedures.
    - a. Metal and Plastic Protective Trim Units:
      - 1) McKinney Products.
      - 2) Trimco Manufacturing TR).
    - b. Door Pulls:
      - 1) McKinney Products.
      - 2) Trimco Manufacturing.
  - 2. Standard: BHMA Certified A156.6.
  - 3. Materials: Fabricate protection plates from the following:
    - a. Stainless Steel: .050 inches thick, beveled four sides (B4E) with countersunk screw holes.
    - b. Furnish protection plates sized two inches less than door width (LDW) on push side and by height specified in door hardware sets.
  - 4. Push/Pull Plates: .050 inch thick, 4 inches wide by 16 inches high with square corners and beveled edges, secured with exposed screws.
    - a. Straight Pull Design: 1-inch round diameter with 10-inch centers and 1 1/2-inch clearance from face of door.
    - b. Offset Pull Design: 1-inch round diameter pull, with 10-inch centers and clearance of 1-1/2 inches from face of door with offset of 45 degrees.
  - 5. Fasteners: Provide manufacturer's designated fastener type as indicated in door hardware sets.

## 2.13 STOPS AND HOLDERS

- A. Manufacturers: Basis of Design provide products by IVES or Rockwood

1. Subject to compliance with requirements, products by one of the following manufacturers may be submitted under the provisions of Division 01, Substitution Procedures.
  - a. Stops and Holders:
    - 1) McKinney Products.
    - 2) Trimco Manufacturing.
  - b. Combination Overhead Stops and Holders:
    - 1) Glynn-Johnson - 100 Concealed and 90 Surface Series
    - 2) Sargent Hardware - 600 Concealed and 500 Surface Series.
2. Standards: Comply with the following:
  - a. Stops and Bumpers: BHMA A156.16, Certified Grade 1.
  - b. Combination Overhead Holders and Stops: BHMA A156.8, Certified Grade 1.
3. Stops and Bumpers: Provide wall stops for all doors unless floor or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead stops and/or holders. Whenever possible, use wall bumpers or dome type door stops. Where it is impractical to use wall stops or bumper, furnish floor type door stops. Wall bumpers suitable to typical substrate - 402.5 or 403.5 by Ives; 403 or 405 by Rockwood.
4. Silencers for Metal Door Frames: BHMA Grade 1; neoprene or rubber, minimum diameter 1/2 inch fabricated for drilled-in application to frame. Provide (3) per single door and (2) per paired door frame if applied gasketing is not specified in Hardware Sets.

#### 2.14 DRIP CAP

- A. Drip cap to be 16 ga. Stainless Steel 1.5" by 1.5" by full width of door opening. Installed on frame above door opening in full bed of sealant, with fasteners at 3" O.C.

#### 2.15 RAIN DRIP

- A. Manufacturers: Basis of Design provide products by Reese.
- B. Drip cap to be aluminum 1.5" by 9/16" by full width of door opening. Installed on frame above door opening in full bed of sealant, with fasteners at 3" O.C.

#### 2.16 DOOR THRESHOLDS, WEATHERSTRIPPING AND GASKETING

- A. Manufacturers: Basis of Design provide products by Reese & Pemko
  1. Subject to compliance with requirements, products by one of the following manufacturers may be submitted under the provisions of Division 01, Substitution Procedures.

2. Door Thresholds, Weatherstripping and Gasket Seals:
  - a. McKinney Weatherstripping Products.
  - b. Zero.
  
- B. Standard: Comply with BHMA A156.22.
  
- C. General: Provide continuous weatherstrip seal on exterior doors and smoke, light, or sound gasketing on interior doors where specified. Provide non-corrosive fasteners for exterior applications.
  1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame. Install header seal before mounting door closer arms.
  2. Meeting Stile Astragals: Fasten to meeting stiles, forming seal when doors are closed.
  3. Door Sweep: Apply to bottom of door, forming seal with threshold when door is closed.
  
- D. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
  1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
  
- E. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
  1. Intumescent Seals and Gasketing: Provide concealed, Category A type gasketing systems on assemblies where an intumescent seal is required to meet IBC and UL-10C positive pressure labeling.

Coordinate remaining Part 2 articles with door hardware schedule. If specifying base metals in Part 2 articles, coordinate with finish designations indicated in door hardware schedule.

If more than one type of a particular product is required, copy applicable paragraphs in Part 2 articles below and insert a unique paragraph heading for each to differentiate products.

Retain option in "Keying System" Paragraph below if retaining "Keying Conference" Paragraph in "Preinstallation Meetings" Article.

- F. Thresholds
  1. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
  2. Compressing-Top Thresholds: Metal member with compressible vinyl seal on top of threshold that seals against bottom of door; and base metal of aluminum.
  3. Saddle Thresholds:
    - a. Type: Fluted top, barrier free.
    - b. Base Metal: Aluminum.
  4. Half-Saddle Thresholds: Fluted-top metal member; and base metal of aluminum.
  5. Provide a pre-drilled (countersunk) aluminum floor plate threshold as scheduled. Thresholds shall be an assembled unit comprised of two supports and a floor plate and one or two pair of mitered returns (when wider than the wall's width). All components shall

anchored to substrate with ¼" Hollow Set Drop-In anchors, and laid in a full bed of high strength cement grout. Thresholds shall satisfy the following conditions for sizing and installation according to substrate, finish floor, interior/exterior grades, frame opening and masonry opening:

6. Thresholds shall cover all interior and exterior slab joints, extending at least 1" beyond them.
7. Thresholds shall cover a ½" minimum of the edge of the finish floor.
8. The threshold's length shall be equal to the width of the masonry opening where it is scheduled to be installed, and shall be cut neatly to fit around jambs. Also, it shall be as wide as the width of the wall that contains the masonry opening (two plates may be required), and no more than ¼" larger on each side.
9. Threshold shall be installed o.c. of masonry opening.
10. When a difference on grades between the interior and the exterior edges of the threshold occurs, provide supports of dissimilar heights to correct the differential on grades.
11. When thresholds' width extend beyond the width's requirements stated in condition 03 above, to satisfy conditions 01 and 02 also above, they shall have a miter returns on both ends. Miter return's corners shall have a miter joint continuously welded and ground smooth. All miter returns shall abut against the walls.
12. Tolerance for all joints and seams of the assembled components shall be lesser 1/32".

#### 2.17 MAGNETIC STEEL DOOR SWITCH

- A. Recessed Steel Door Switch Set shall be provided and ready to be connected (available wire leads in conduit inside the frame) to a Remote Indicating Panel (RIP), where available or for future application. These switches are designed primarily to serve as: Sensing devise to detect the opening of a door, assuring that a protected door is securely under surveillance; trigger for the wall mounted Exit Alarm, which will signal that a door has been inadvertently left open; and direct switch to set off many kinds of audio and/or visual alarms. Provide model 8080-T magnetic steel door switch set, by GRI Telemark Corp., GRI Plaza, Kimball, Nebraska 69145. Color to be selected by the Architect or Engineer.
- B. Overhead mounted is required. The switch contacts are housed in the door frame separate from the magnet which is recessed into the key side of the door @ 3" o.c. from the top side of the door. Provide factory punched holes on frames and doors. When field drilling might be needed, door and frame must be templated, in order to achieve the proper alignment of the pair of contacts. Mortar box must be installed in all frames where switch contacts are to be inserted.

#### 2.18 JUNCTION BOX - MORTAR SHIELD FOR DOOR SWITCH

- A. Provide one junction box/mortar shield per each door leaf at each exterior frame. Fast junction box/mortar shield to the frame with SS countersunk TORX pinhead screws. Paint with bituminous paint the surface of the junction box/mortar shield that will be in contact with the frame.
  1. JB-2 Junction Box & Mortar Shield by Stanley.
- B. Connect a ½" flexible metal conduit to side outlet of the junction box/mortar shield with a 90° connector for flexible metal conduit. Connect the other end of the conduit to the punched hole on the indoor face of the frame with a straight connector for flexible conduit. This will allow at any time the wiring of the switch into the building. See detailed drawing.

## 2.19 KEYS HOUSING BOX

- A. Provide at each facility one key cabinet, master keyed to building system. Cabinet shall be made of sheet metal with a baked enamel finish, colored as selected by the Architect or Engineer; it shall have the capacity to handle this Project plus 25 percent expansion. Cabinet to include Best 1EJ74 cabinet lock with interchangeable core.
- B. Regent model #RWC 25S by Tel-Kee.

## 2.20 FASTENERS

- A. Furnish necessary screws, bolts, and other fasteners of suitable size and type to anchor the hardware in position for long life and hard use. Use one way or Torx pin-head screws on all hardware.
- B. Where necessary, furnish fasteners with toggle bolts, expansion shields, sex bolts, and other anchors approved by the Architect or Engineer, according to the material to which the hardware is to be applied and according to the recommendations of the hardware manufacturer.
- C. Setting of fasteners shall not be done into or by-mean-of “adjusta-screws”. Manufacturers’ recommended fasteners will be driven into the pre-tapped holes for fully templates mortised hardware, following an approved hardware schedule and templates.
- D. Provide fasteners which harmonize with the hardware as to finish and materials.

## 2.21 SHOP CUTS

- A. Any cutting must be done in the manufacturer shop. No field cutting will be accepted. This applies, but not limited to armor, push, pull and kick plates; also, frames and doors.
- B. Indicate on shop drawings submission the location of shop cuts, punches and perforations. This applies, but not limited to armor, push, pull and kick plates; also, frames and doors.

## 2.22 WELDING

- A. All welding shall be of continuous type. Provide filler wire similar to the material being welded. All welding shall be ground smooth to blend with the surrounding finish.

## 2.23 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Finish hardware, except as otherwise noted, to be of stainless steel with US32D finish. Where items are not manufactured in stainless steel, dull chrome US26D shall be furnished.
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

- D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Notify architect of any discrepancies or conflicts between door schedule, door types, drawings and scheduled hardware. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Steel Doors and Frames: For surface-applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

### 3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
  - 1. Contractors' installers are to be trained and certified by a door hardware manufacturer representative on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated in attachment for Hardware Mounting Heights. or required to comply with governing regulations:
  - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
  - 2. Custom Steel Doors and Frames: HMMA 831.
  - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
- C. Boxed Power Supplies: Verify locations with Architect.

1. Configuration: Provide the least number of power supplies required to adequately serve doors with access control equipment.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
  2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- F. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- G. Lock Cylinders: Install construction cores to secure building and areas during construction period.
1. Replace construction cores with permanent cores as directed by PPR.
- H. Key Control System:
1. Key Control Cabinet: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
  2. Key Lock Boxes: Install where indicated or approved by Architect to provide controlled access for fire and medical emergency personnel.
  3. Key Control System Software: Set up multiple-index system based on final keying schedule.
- I. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- J. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
1. Do not notch perimeter gasketing to install other surface-applied hardware.
- K. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- L. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

### 3.4 FIELD QUALITY CONTROL

- A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

### 3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
  - 1. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.
- B. Six-Month Adjustment: Approximately six months after date of Substantial Completion, Installer shall perform the following:
  - 1. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
  - 2. Consult with and instruct *Philadelphia Parks and Recreation Department's* personnel on recommended maintenance procedures.
  - 3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

### 3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish, provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of *Philadelphia Parks and Recreation Department* occupancy.

### 3.7 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for PPR's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include nine months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.



### 3.8 DEMONSTRATION

- A. Engage a factory-authorized representative to train *Philadelphia Parks and Recreation Department's* maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware

### 3.9 DOOR HARDWARE SETS

- A. The hardware sets listed below represent the design intent and direction of the *Philadelphia Parks and Recreation Department* and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process.
  - 1. Hardware mounting locations specific for each hardware set are shown on the door diagram drawing immediately following the associated hardware set description below.

<b>HARDWARE SET No. 1</b>	<b><i>EXIT Exterior Pair of Doors with a Removable Mullion.<sup>1</sup></i></b>	
(2) Continuous Hinges	HG-305 (SS) NRP	Markar
(2) Closer	4211H-CUSH (ST3011 size 4)	LCN
(1) High Security Cylinder	1E7K4-32-S2 (Active leaf)	Best
(2) Extended Cylinder	1E72 (provide with Exit Devices CD function)	Best
(1) Exit Device	CD-18-M-816L-3 <SUTRO level <sup>2</sup> >	Monarch
(1) Exit Device	CD-18-M-EO-3	Monarch
(2) Security Astragal	EG-T-308 (continuous)	Markar
(1) Assembly Set Threshold <sup>3</sup>	234A to 280A <sup>4</sup> +(2)S247A+261A	Reese
(2) Kick Plates	J102 x US16(0.0625") x 12" x 1½" < Dr.W	Rockwood
(2) Armor Plates (SS)	J101 x US16(0.0625") x 36" x 1½" < Dr.W	Rockwood
(2) Set Weatherstrip	353A & 807A	Reese
(1) Set Magnetic Switch <sup>5</sup>	8080T (Recess type) or 250-36 (Surface type)	GRI
(2) Mortar Boxes <sup>6</sup>	JB-2 Junction Box	Stanley
(1) Drip Cap <sup>7</sup>	R199A	Reese

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<sup>1</sup> Removable mullion to be fabricated by door frame manufacturer with the same profile and material of the door frame.

<sup>2</sup> Rim locks with pull-handle on the 6 o'clock position. The handle unlatching action is enabled by key from outside.

<sup>3</sup> Cut thresholds to fit around the mullion. Thresholds will be set in a full bed of grout.

<sup>4</sup> Absolute width may vary per each door as defined in item 2.10 of this Section. Also, a combination of two sizes may be required.

<sup>5</sup> Install on new frames switch magnetic sensor 8080T set in a STANLEY junction box/mortar shield. Install 250-36 on existing frames only.

<sup>6</sup> Apply bituminous paint to the mortar box's surface that will be in contact with the frame.

<sup>7</sup> Continuous on frame head, completely across masonry opening. Do not install on doors under a canopy or an overhang.

**HARDWARE SET No. 2*****EXIT Exterior Single Door***

(1) Continuous Hinge	HG-305 (SS) NRP	Markar
(1) Closer	4211H-CUSH (ST3011 size 4)	LCN
(1) High Security Cylinder	1E7K4-32-S2	Best
(1) Extended Cylinder	1E72 (provide with Exit Devices CD function)	Best
(1) Exit Device	CD-25-M-511L-3 <SUTRO level <sup>8</sup> >	Falcon
(1) Kick Plate	J102 x US16(0.0625") x 12" x 1½" < Dr.W	Rockwood
(1) Armor Plate	J101 x US16(0.0625") x 36" x 1½" < Dr.W	Rockwood
(1) Security Astragal	EG-T-308 (continuous)	Markar
(1) Threshold	234A to 280A <sup>9</sup> +(2)S247A+261A	Reese
(1) Set Weatherstrip	353A & 807A	Reese
(1) Set Magnetic Switch <sup>10</sup>	8080T (Recess type) or 250-36 (Surface type)	GRI
(1) Mortar Box <sup>11</sup>	JB-2 Junction Box	Stanley
(1) Drip Cap <sup>12</sup>	R199A	Reese

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<sup>8</sup> Rim locks with pull-handle on the 6 o'clock position. The handle unlatching action is enabled by key from outside.

<sup>9</sup> Absolute width may vary per each door as defined in item 2.10 of this Section. Also, a combination of two sizes may be required.

<sup>10</sup> Install on new frames switch's magnetic sensor 8080T set in a STANLEY junction box/mortar shield. Install 250-36 on existing frames.

<sup>11</sup> Apply bituminous paint on mortar box's surface that will be in contact with the frame.

<sup>12</sup> Continuous on frame head, completely across masonry opening. Do not provide under or overhang canopy

**HARDWARE SET No. 3*****Exterior Single Door***

(1) Continuous Hinge	HG-305 (SS) NRP	Markar
(1) Closer	4211H-CUSH (ST3011 size 4)	LCN
(1) Deadbolt	48H-7-K-1E7K4-32-S2 or 48H-7-R-1E7K4-32-S2 <sup>13</sup>	Best
(2) Pull Plate <sup>14</sup>	93	Rockwood
(1) Kick Plate	J102 x US16(0.0625") x 12" x 1½" < Dr.W	Rockwood
(1) Armor Plate	J101 x US16(0.0625") x 36" x 1½" < Dr.W	Rockwood
(1) Security Astragal	EG-T-308 (continuous)	Markar
(1) Threshold	234 A to 280A <sup>15</sup> +(2)S247A+261A	Reese
(1) Set Weatherstrip	353A & 807A	Reese
(1) Set Magnetic Switch <sup>16</sup>	8080T (Recess type) or 250-36 (Surface type)	GRI
(1) Mortar Box <sup>17</sup>	JB-2 Junction Box	Stanley
(1) Drip Cap <sup>18</sup>	R199A	Reese

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<sup>13</sup> Install locks with "R" function on exterior doors at any room with an exterior door as the only exit.

<sup>14</sup> Install under the upper half portion of the pull plate a 14 gauge SS filler plate with flushed edges.

<sup>15</sup> Absolute width may vary per each door as defined in item 2.10 of this Section. Also, a combination of two sizes may be required.

<sup>16</sup> Install on new frames switch's magnetic sensor 8080T set in a STANLEY junction box/mortar shield. Install 250-36 on existing frames.

<sup>17</sup> Apply bituminous paint on mortar box's surface that will be in contact with the frame.

<sup>18</sup> Continuous on frame head, completely across masonry opening.

<b>HARDWARE SET No. 4</b>	<b><i>Interior Single Door (Closet, and Janitor's Closet)</i></b>	
(1½) Pair Hinges	IHTCBI961-4½" (Butt) NRP	Stanley
(1) Deadlatch	83T-7(5C7DD)-S-S5	Best
(1) Pull Plate	93	Rockwood
(1) Kickplate @ room or corridor side only	J102 x US16(0.0625") x 12" x ¼" < Dr.W	Rockwood
(1) Set Silencers	No. 20	Ives
(1) Wall Bumper <sup>19</sup>	402½ or 403½	Ives

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<sup>19</sup>Doors swinging up to 135° only. Use 402½ on GWB and hollow CMU, and 403½ on solid masonry.

**HARDWARE SET No. 5*****Toilet Room Doors***

(1½)	Pr. Hinges	IHTCB1961-4 ½" (Butt) NRP	Stanley	
(1)	Deadbolt	83T-7(5C7DD)-S-S1	Best,	OR
(1)	Deadlatch	93K-7(5C7DD)-T-15D-S3 <sup>20</sup>	Best,	OR
(1)	Deadbolt	83T-7(5C7DD)-L-S5-CS <sup>21</sup>	Best	
(1)	Closer	4211H-CUSH (ST3011 size 4)	LCN	
(2)	Pull	93	Rockwood	
(1)	Kick Plates	J102 x US16(0.0625") x 12" x ¼" < Dr.W	Rockwood	
(1)	Kick Plates	J102 x US16(0.0625") x 12" x 1" < Dr.W	Rockwood	
(1)	Wall bumper <sup>22</sup>	402½ or 403½	Ives	
(1)	Set Silencers	No. 20	Ives	
(1)	Sign <sup>23</sup> - Men Restroom	BF684-US26D	Rockwood,	OR
(1)	Sign <sup>51</sup> - Men ADA Restroom	BF687-US26D	Rockwood,	OR
(1)	Sign <sup>51</sup> - Women Restroom	BF685-US26D	Rockwood,	OR
(1)	Sign <sup>51</sup> - Women ADA Restroom	BF688-US26D	Rockwood,	OR
(1)	Sign <sup>51</sup> - Unisex Restroom	BF686-US26D	Rockwood,	OR
(1)	Sign <sup>51</sup> - Unisex ADA Restroom	BF689-US26D	Rockwood	

**HARDWARE SET No. 5A*****Unisex Toilet Room Doors***

Refer to hardware above; provide interior turn lock

<sup>20</sup>Required for emergency access at **single compartment handicap toilet room only**, in lieu of 83T-7-S-S1 type.

<sup>21</sup>Required only when a bathroom has an interior and an exterior doors. This deadbolt must be installed on the interior door.

<sup>22</sup>Doors swinging up to 135° only. Use 402½ on GWB and hollow CMU, and 403½ on solid masonry.

<sup>23</sup>Install a suitable sign from those listed here on the door per schedule.

<b>HARDWARE SET No. 6</b>		<b><i>Interior Single Door (Classroom)</i></b>	
(1 ½)	Pairs Hinges	IHTCB1961-4 ½" (Butt) NRP	Stanley
(1)	Deadbolt	83T-7(5C7DD)-S-S5-32	Best
(2)	Pull Plate	93	Rockwood
(1)	Closer	4211H-CUSH (ST3011 size 4)	LCN
(1)	Kickplate	J102 x US16(0.0625") x 12" x ¼" < Dr.W	Rockwood
(1)	Kickplate	J102 x US16(0.0625") x 12" x 1" < Dr.W	Rockwood
(1)	Wall Bumper	402½ or 403½	Ives
(1)	Set Silencers	No. 20	Ives

<b>HARDWARE SET No. 6A</b>		<b><i>Interior Single Door (Office)</i></b>	
(1 ½)	Pairs Hinges	IHTCB1961-4 ½" (Butt) NRP	Stanley
(1)	Deadbolt	83T-7(5C7DD)-S-S5-32	Best
(2)	Pull Plate	93	Rockwood
(1)	Closer	4211H-CUSH (ST3011 size 4)	LCN
(1)	Kickplate	J102 x US16(0.0625") x 12" x ¼" < Dr.W	Rockwood
(1)	Kickplate	J102 x US16(0.0625") x 12" x 1" < Dr.W	Rockwood
(1)	Wall Bumper	402½ or 403½	Ives
(1)	Set Silencers	No. 20	Ives

<b>HARDWARE SET No. 6B</b>		<b><i>Interior Single Door (Corridor Egress)</i></b>	
(1 ½)	Pairs Hinges	IHTCB1961-4 ½" (Butt) NRP	Stanley
(1)	Deadbolt	83T-7(5C7DD)-S-S5-32	Best
(2)	Pull Plate	93	Rockwood
(1)	Exit Device	F-18-M-EO-3	Monarch
(1)	Closer	4211H-CUSH (ST3011 size 4)	LCN
(1)	Kickplate	J102 x US16(0.0625") x 12" x ¼" < Dr.W	Rockwood
(1)	Kickplate	J102 x US16(0.0625") x 12" x 1" < Dr.W	Rockwood
(1)	Wall Bumper	402½ or 403½	Ives
(1)	Set Silencers	No. 20	Ives

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**HARDWARE SET No. 7**      *Interior Pair of Doors with a Removable Mullion<sup>24</sup>.*

(3)	Pr. Hinges	IHTCB1961R-4½" (Butt) NRP	Stanley
(1)	Deadbolt	83T-7(5C7DD)-S-S5-32>	Ives
(2)	Surface Bolt	360 (8" size) (bottom bolt engages mullion only, not floor)	Ives
(2)	Closer	4211H-CUSH (ST3011 size 4)	LCN
(2)	Push	73F	Rockwood
(2)	Pull	93	Rockwood
(2)	Kickplate	J102 x US16(0.0625") x 12" x ¼" < Dr.W	Rockwood
(2)	Kickplate	J102 x US16(0.0625") x 12" x 1" < Dr.W	Rockwood
(2)	Wall bumper <sup>25</sup>	402½ or 403½	Ives
(2)	Set Silencers	No. 20	Ives

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<sup>24</sup> Removable mullion to be fabricated by door frame manufacturer with the same profile and material of the door frame.

<sup>25</sup> When doors swinging up to 135° only. Use 402½ on GWB and hollow CMU, and 403½ on solid masonry.

HARDWARE MOUNTING HEIGHTS

- A. Hardware Mounting Heights to be as indicated on Construction Drawings.

END OF SECTION 087111

## SECTION 088000

### GLAZING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
  - 1. Windows.
  - 2. Doors.
  - 3. Storefront framing.
  - 4. Interior borrowed lites.

##### 1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 and ICC's 2018 International Building Code by a qualified professional engineer, using the following design criteria. Engineer must be licensed / registered in State of Pennsylvania.
  - 1. Design Wind Pressures: As indicated on Drawings.
  - 2. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
  - 3. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
  - 4. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

##### 1.3 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
  - 1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

##### 1.4 ACTION SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.

- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- D. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Engineer must be licensed / registered in State of Pennsylvania.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Preconstruction adhesion and compatibility test report.

#### 1.6 QUALITY ASSURANCE

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  - 1. GANA Publications: GANA's "Glazing Manual."
  - 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
  - 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
  - 4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

#### 1.7 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
  - 1. Warranty Period: 10 years from date of Substantial Completion.

- B. **Manufacturer's Special Warranty on Laminated Glass:** Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
1. Warranty Period: 10 years from date of Substantial Completion.
- C. **Manufacturer's Special Warranty on Insulating Glass:** Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
1. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 GLASS PRODUCTS, GENERAL

- A. **Thickness:** Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
- B. **Strength:** Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.
- C. **Windborne-Debris-Impact Resistance:** Provide exterior glazing that passes basic-protection testing requirements in ASTM E 1996 for Wind Zone 2 when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than glazing indicated for use on the Project and shall be installed in same manner as glazing indicated for use on the Project.
1. Large-Missile Test: For all glazing, regardless of height above grade.
- D. **Thermal and Optical Performance Properties:** Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
  2. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.

3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

## 2.2 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

## 2.3 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
  1. Sealing System: Dual seal.
  2. Spacer: Manufacturer's standard spacer material and construction.

## 2.4 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
  1. Neoprene complying with ASTM C 864.
  2. EPDM complying with ASTM C 864.
- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene or EPDM gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.
  1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

## 2.5 GLAZING SEALANTS

- A. General:
  1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
  2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

3. Sealants used inside the weatherproofing system, shall have a VOC content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  4. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
  5. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

## 2.6 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
1. AAMA 804.3 tape, where indicated.
  2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
  3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
  2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

## 2.7 MISCELLANEOUS GLAZING MATERIALS

- A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- B. Setting Blocks: Neoprene or EPDM; 80-90 Shore A durometer hardness.
- C. Spacers: Neoprene; 50-60 Shore A durometer hardness.
- D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- E. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

## 2.8 MONOLITHIC-GLASS TYPES

- A. Glass Type GL-1: Clear fully tempered float glass.
  - 1. Thickness: 6.0 mm.
  - 2. Provide safety glazing labeling.

## 2.9 INSULATING-GLASS TYPES

- A. Glass Type GL-2: Low-e-coated, clear insulating glass.
  - 1. Overall Unit Thickness: 1 inch.
  - 2. Thickness of Each Glass Lite: 6.0 mm.
  - 3. Outdoor Lite: Clear fully tempered float glass.
  - 4. Interspace Content: Air.
  - 5. Indoor Lite: Clear fully tempered float glass.
  - 6. Low-E Coating: Pyrolytic on second surface.
  - 7. Visible Light Transmittance: 95% percent minimum.
  - 8. Winter Nighttime U-Factor: 0.45 maximum.
  - 9. Summer Daytime U-Factor: 0.45 maximum.
  - 10. Solar Heat Gain Coefficient: 0.4 maximum.
  - 11. Provide safety glazing labeling.

## PART 3 - EXECUTION

### 3.1 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.



- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

### 3.2 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Apply heel bead of elastomeric sealant.
- F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- G. Apply cap bead of elastomeric sealant over exposed edge of tape.

### 3.3 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to

produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

- E. Install gaskets so they protrude past face of glazing stops.

### 3.4 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

### 3.5 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION 088000

## **SECTION 089119**

### **FIXED LOUVERS**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section includes fixed, extruded-aluminum louvers.

##### **1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
- C. Samples: For each type of metal finish required.
- D. Delegated-Design Submittal: For louvers indicated to comply with structural performance requirements, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Professional Engineer must be licensed/registered in the State of Pennsylvania.

##### **1.3 INFORMATIONAL SUBMITTALS**

- A. Product Test Reports: Based on tests performed according to AMCA 500-L.
- B. Windborne-debris-impact-resistance test reports.

#### **PART 2 - PRODUCTS**

##### **2.1 PERFORMANCE REQUIREMENTS**

- A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural performance requirements and design criteria indicated. Professional Engineer must be licensed/registered in the State of Pennsylvania.
- B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or

permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. Wind Loads: Determine loads based on pressures as indicated on Drawings.
  2. Wind Loads: Determine loads based on a uniform pressure of 20 lbf/sq. ft. acting inward or outward.
- C. Windborne-Debris-Impact Resistance: Louvers located within 30 feet of grade shall pass basic-protection, large-missile testing requirements in ASTM E 1996 for Wind Zone 2 when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than louvers indicated for use on Project.
- D. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

## 2.2 FIXED, EXTRUDED-ALUMINUM LOUVERS

### A. Horizontal, Wind-Driven-Rain-Resistant Louver:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. [Air Balance Inc.; a Mestek company.](#)
  - b. [Air Flow Company, Inc.](#)
  - c. [Airolite Company, LLC \(The\).](#)
  - d. [All-Lite Architectural Products.](#)
  - e. [American Warming and Ventilating; a Mestek company.](#)
  - f. [Architectural Louvers; Harray, LLC.](#)
  - g. [Arrow United Industries; a division of Mestek, Inc.](#)
  - h. [Construction Specialties, Inc.](#)
  - i. [Greenheck Fan Corporation.](#)
  - j. [Industrial Louvers, Inc.](#)
  - k. [NCA Manufacturing, Inc.](#)
  - l. [Nystrom, Inc.](#)
  - m. [Pottorff.](#)
  - n. [Reliable Products, Inc.](#)
  - o. [Ruskin Company; Tomkins PLC.](#)
  - p. [United Enertech.](#)
2. Louver Depth: 4 inches.
3. Frame and Blade Nominal Thickness: Not less than 0.080 for blades and 0.080 inch for frames.
4. Louver Performance Ratings:
  - a. Free Area: Not less than 5.0 sq. ft for 48-inch-wide by 48-inch-high louver.

- b. Air Performance: Not more than 0.10-inch wg static pressure drop at 600-fpm free-area intake velocity.
  - c. Wind-Driven Rain Performance: Not less than 95 percent effectiveness when subjected to a rainfall rate of 3 inches per hour and a wind speed of 29 mph at a core-area intake velocity of 300 fpm.
5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

## 2.3 LOUVER SCREENS

- A. General: Provide screen at each exterior louver.
  - 1. Screen Location for Fixed Louvers: Interior face.
  - 2. Screening Type: Bird screening.
- B. Louver Screen Frames: Same type and form of metal as indicated for louver to which screens are attached.
- C. Louver Screening for Aluminum Louvers:
  - 1. Bird Screening: Aluminum, 1/2-inch-square mesh, 0.063-inch wire.

## 2.4 MATERIALS

- A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5, T-52, or T6.
- B. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Fasteners: Use types and sizes to suit unit installation conditions.
  - 1. Use tamper-resistant screws for exposed fasteners unless otherwise indicated.
  - 2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
  - 3. For fastening galvanized steel, use hot-dip-galvanized steel or 300 series stainless-steel fasteners.
  - 4. For fastening stainless steel, use 300 series stainless-steel fasteners.
  - 5. For color-finished louvers, use fasteners with heads that match color of louvers.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

## 2.5 FABRICATION

- A. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

- B. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

## 2.6 ALUMINUM FINISHES

- A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  - 1. Color and Gloss: Coordinate with exterior elevations. Louvers to match typical PNT-8 metal paint finish.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- D. Protect unpainted galvanized and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

### 3.2 ADJUSTING

- A. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

END OF SECTION 089119

## SECTION 092216

### NON-STRUCTURAL METAL FRAMING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
2. Suspension systems for interior gypsum ceilings and soffits.

##### 1.2 ACTION SUBMITTALS

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

#### PART 2 - PRODUCTS

##### 2.1 FRAMING SYSTEMS

###### A. Steel Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners of equivalent minimum base-metal thickness.

1. Minimum Base-Metal Thickness: 0.018 inch.
2. Depth: As indicated on Drawings.

###### B. Slip-Type Head Joints: Where indicated, provide one of the following in thickness not less than indicated for studs and in width to accommodate depth of studs:

1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch-deep flanges, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch-deep flanges and fastened to studs, and outer runner sized to friction fit inside runner.
3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes due to deflection of structure above.

###### a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- 1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
- 2) MBA Building Supplies; FlatSteel Deflection Track or Slotted Deflecto Track.
- 3) Steel Network Inc. (The); VertiClip SLD or VertiTrack VTD Series.

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- 4) [Superior Metal Trim; Superior Flex Track System \(SFT\)](#).
  - 5) [Telling Industries](#); Vertical Slip Track or Vertical Slip Track II.
- C. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Metal Thickness: 0.018 inch.
- D. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-metal thickness, with minimum 1/2-inch-wide flanges.
1. Depth: 1-1/2 inches.
  2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.
- E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Minimum Base-Metal Thickness: 0.018 inch.
  2. Depth: 1-1/2 inches.
- F. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.
1. Depth: 3/4 inch.
  2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch.
  3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.
- G. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.018 inch, and depth required to fit insulation thickness indicated.

## 2.2 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.
- B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- C. Flat Hangers: Steel sheet, 1 by 3/16 inch.
- D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch and minimum 1/2-inch-wide flanges.
1. Depth: As indicated on Drawings.
- E. Furring Channels (Furring Members):



1. Cold-Rolled Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
2. Steel Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners of equivalent minimum base-metal thickness.
  - a. Minimum Base-Metal Thickness: 0.018 inch.
  - b. Depth: As indicated on Drawings.
3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
  - a. Minimum Base-Metal Thickness: 0.018 inch.

### 2.3 AUXILIARY MATERIALS

- A. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide asphalt saturated organic felt or foam gasket.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
  1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

### 3.2 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.

- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
  2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
    - a. Install two studs at each jamb unless otherwise indicated.
    - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
  3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
- E. Direct Furring:
1. Screw to wood framing.
  2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- F. Z-Furring Members:
1. Erect insulation vertically and hold in place with Z-furring members spaced 24 inches o.c.
  2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
  3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.
- G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

### 3.3 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
    - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
  - 3. Do not attach hangers to steel roof deck.
  - 4. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
  - 5. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
  - 6. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

**SECTION 092900**  
**GYPSUM BOARD**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Interior gypsum board ceilings.

1.2 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. American Gypsum.
  2. CertainTeed Corp.
  3. Georgia-Pacific Gypsum LLC.
  4. Lafarge North America Inc.
  5. National Gypsum Company.
  6. PABCO Gypsum.
  7. Temple-Inland.
  8. USG Corporation.
- B. High-Impact Gypsum Board: ASTM C 1629/C 1629M, Level 3.
1. Core: 5/8 inch.
  2. Backing: 1/2" plywood.
  3. Long Edges: Tapered.
  4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.2 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
- B. Aluminum Trim: ASTM B 221, Alloy 6063-T5.

## 2.3 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
  1. Interior Gypsum Board: Paper.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

## 2.4 AUXILIARY MATERIALS

- A. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
  1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  2. Laminating adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
- C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing).
- D. Acoustical Joint Sealant: ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings as demonstrated by testing according to ASTM E 90.
  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. [Accumetric LLC; BOSS 824 Acoustical Sound Sealant.](#)
    - b. [Grabber Construction Products; Acoustical Sealant GSC.](#)
    - c. [Pecora Corporation; AC-20 FTR, AIS-919.](#)
    - d. [Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.](#)
    - e. [USG Corporation; SHEETROCK Acoustical Sealant.](#)
  2. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  3. Acoustical joint sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- E. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."
- F. Vapor Retarder: As specified in Section 072100 "Thermal Insulation."

### PART 3 - EXECUTION

#### 3.1 APPLYING AND FINISHING PANELS

- A. Comply with ASTM C 840.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- D. Install trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
  - 1. Aluminum Trim: Install in locations indicated on Drawings.
  - 2. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- E. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- F. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- G. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
  - 1. Level 1: At panel surfaces that will be exposed to view unless otherwise indicated.
    - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

END OF SECTION 092900

## SECTION 093000

### TILING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Ceramic tile.
2. Stone thresholds.
3. Crack isolation membrane.

##### 1.2 ACTION SUBMITTALS

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

###### B. Samples:

1. Each type and composition of tile and for each color and finish required.
2. Assembled samples, with grouted joints, for each type and composition of tile and for each color and finish required.
3. Stone thresholds in 6-inch lengths.

##### 1.3 MAINTENANCE MATERIAL SUBMITTALS

###### A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

##### 1.4 QUALITY ASSURANCE

###### A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of floor tile installation.
2. Build mockup of wall tile installation.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 TILE PRODUCTS

- A. Ceramic Tile Standards: Provide Standard grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated. Follow the TCNA "Handbook for Ceramic, Glass, and Stone Tile Installation" guidelines for large format tile installation methods. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods.
- B. FloorScore Compliance: Tile for floors shall comply with requirements of FloorScore Standard.
- C. Low-Emitting Materials: Tile flooring systems shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Tile Type CT-1: Factory-mounted unglazed ceramic mosaic tile.
  - 1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. American Olean; Division of Dal-Tile International Inc.
    - b. Crossville, Inc.
    - c. Daltile; Division of Dal-Tile International Inc.
    - d. Deutsche Steinzeug America, Inc.
    - e. Interceramic.
    - f. Lone Star Ceramics Company.
    - g. Grupo Porcelanite.
    - h. Portobello America, Inc.
    - i. Seneca Tiles, Inc.
  - 3. Composition: Porcelain.
  - 4. Module Size: 2 by 2 inches.
  - 5. Thickness: 1/4 inch.
  - 6. Face: Plain, with cushion edges.
  - 7. Surface: Slip-resistant, with abrasive admixture. Dynamic Coefficient of Friction: Not less than 0.42.
  - 8. Finish: Mat, opaque glaze.
  - 9. Tile Color and Pattern: As selected by Architect from manufacturer's full range.
  - 10. Grout Color: As selected by Architect from manufacturer's full range.
- E. Tile Type CT-2: Glazed wall tile.



1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. [American Marazzi Tile, Inc.](#)
  - b. [American Olean; Division of Dal-Tile International Inc.](#)
  - c. [Daltile; Division of Dal-Tile International Inc.](#)
  - d. [Deutsche Steinzeug America, Inc.](#)
  - e. [Florida Tile Industries, Inc.](#)
  - f. [Florim USA.](#)
  - g. [Laufen.](#)
  - h. [Grupo Porcelanite.](#)
  - i. [Portobello America, Inc.](#)
  - j. [Seneca Tiles, Inc.](#)
  - k. [United States Ceramic Tile Company.](#)
2. Module Size: 6 by 6 inches.
3. Thickness: 5/16 inch.
4. Face: Plain with modified square edges or cushion edges.
5. Finish: Bright, opaque glaze.
6. Tile Color and Pattern: As selected by Architect from manufacturer's full range.
7. Grout Color: As selected by Architect from manufacturer's full range.
8. Mounting: Factory, back mounted.
9. Mounting: Pregouted sheets of tiles factory assembled and grouted with manufacturer's standard white silicone rubber.
10. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
  - a. Base: Coved, module size 6 by 12 inches.
  - b. Wainscot Cap: Bullnose cap, module size 6 by 12 inches.
  - c. External Corners for Thin-Set Mortar Installations: Bullnose shape, same size as adjoining flat tile.
  - d. Internal Corners: Field-buttet square corners. For coved base and cap use angle pieces designed to fit with stretcher shapes.

## 2.2 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
  1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.
- B. Marble Thresholds: ASTM C 503, with a minimum abrasion resistance of 12 per ASTM C 1353 or ASTM C 241 and with honed finish.
  1. Description: Uniform, fine- to medium-grained white stone with gray veining.

2. Description: Match Architect's sample.

### 2.3 CRACK ISOLATION MEMBRANE

- A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated.
- B. Chlorinated-Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 0.030-inch nominal thickness.
  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. Noble Company (The); Nobleseal CIS.
- C. PVC Sheet: Two layers of PVC sheet heat-fused together and to facings of nonwoven polyester; 0.040-inch nominal thickness.
  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. Compotite Corporation; Composeal Gold.
- D. Polyethylene Sheet: Polyethylene faced on both sides with fleece webbing; 0.008-inch nominal thickness.
  1. **Products:** Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Schluter Systems L.P.; KERDI.
- E. Fabric-Reinforced, Modified-Bituminous Sheet: Self-adhering, modified-bituminous sheet with fabric reinforcement facing; 0.040-inch nominal thickness.
  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. MAPEI Corporation; Mapelastic SM.
    - b. National Applied Construction Products, Inc.; Strataflex.
- F. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and fabric reinforcement.
  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. Boiardi Products, a QEP company; Elastiment 344 Reinforced Waterproofing and Anti-Fracture/Crack Suppression Membrane.

- b. [Bonsal American, an Oldcastle company; B 6000 Waterproof Membrane with Glass Fabric.](#)
- c. [Bostik, Inc.; Hydroment Blacktop 90210.](#)
- d. [Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane.](#)
- e. [Laticrete International, Inc.; Laticrete Blue 92 Anti-Fracture Membrane or 9235 Waterproof Membrane.](#)
- f. [MAPEI Corporation; Mapelastic L \(PRP M19\) or Mapelastic HPG with MAPEI Fiberglass Mesh.](#)
- g. [Mer-Kote Products, Inc.; Hydro-Guard 2000.](#)
- h. [Summitville Tiles, Inc.; S-9000.](#)

G. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.

- 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. [Bostik, Inc.; Durabond D-222 Duraguard Membrane or Hydroment Gold.](#)
  - b. [C-Cure; CureLastic 949 or Pro-Red Waterproofing Membrane 963.](#)
  - c. [Custom Building Products; Redgard Waterproofing and Crack Prevention Membrane, FractureFree Crack Prevention Membran or Semco Crack Prevention Membrane.](#)
  - d. [Jamo Inc.; Waterproof.](#)
  - e. [Mer-Kote Products, Inc.; Fracture-Guard 5000.](#)
  - f. [Southern Grouts & Mortars, Inc.; Southcrete 1100 Crack Suppression and Waterproofing.](#)
  - g. [TEC, a subsidiary of H. B. Fuller Company; HydraFlex - Waterproofing Crack Isolation Membrane.](#)

H. Latex-Portland Cement: Flexible mortar consisting of cement-based mix and latex additive.

- 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. [C-Cure; UltraCure 971.](#)
  - b. [MAPEI Corporation; Mapelastic \(PRP 315\).](#)
  - c. [TEC, a subsidiary of H. B. Fuller Company; Triple Flex Waterproofing, Crack Isolation Membrane & Mortar.](#)

I. Urethane Crack Isolation Membrane and Tile-Setting Adhesive: One-part, liquid-applied urethane.

- 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. [Bostik, Inc.; Durabond D-200, Hydroment Ultra-Set or Hydroment Ultra-Set Advanced.](#)

## 2.4 SETTING MATERIALS

### A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.

1. 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. [Boiardi Products; a QEP company.](#)
  - b. [Bonsal American; an Oldcastle company.](#)
  - c. [Bostik, Inc.](#)
  - d. [C-Cure.](#)
  - e. [Custom Building Products.](#)
  - f. [Jamo Inc.](#)
  - g. [Laticrete International, Inc.](#)
  - h. [MAPEI Corporation.](#)
  - i. [Mer-Kote Products, Inc.](#)
  - j. [Southern Grouts & Mortars, Inc.](#)
  - k. [Summitville Tiles, Inc.](#)
  - l. [TEC; a subsidiary of H. B. Fuller Company.](#)
2. Prepackaged, dry-mortar mix to which only water must be added.
3. Prepackaged, dry-mortar mix combined with liquid-latex additive.
4. For wall applications, provide nonsagging mortar.

## 2.5 GROUT MATERIALS

### A. Standard Cement Grout: ANSI A118.6.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. [Boiardi Products; a QEP company.](#)
  - b. [Bonsal American; an Oldcastle company.](#)
  - c. [Bostik, Inc.](#)
  - d. [C-Cure.](#)
  - e. [Custom Building Products.](#)
  - f. [Jamo Inc.](#)
  - g. [Laticrete International, Inc.](#)
  - h. [MAPEI Corporation.](#)
  - i. [Southern Grouts & Mortars, Inc.](#)
  - j. [Summitville Tiles, Inc.](#)
  - k. [TEC; a subsidiary of H. B. Fuller Company.](#)

## 2.6 ELASTOMERIC SEALANTS

- A. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.
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. [DAP Inc.; Titanium Enriched Kitchen and Bath Sealant or 100 percent Silicone Kitchen and Bath Sealant.](#)
    - b. [Dow Corning Corporation; Dow Corning 786.](#)
    - c. [GE Silicones, a division of GE Specialty Materials; Sanitary 1700.](#)
    - d. [Laticrete International, Inc.; Latasil Tile & Stone Sealant.](#)
    - e. [Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.](#)
    - f. [Tremco Incorporated; Tremsil 600 White.](#)

## 2.7 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.
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. [Bonsal American, an Oldcastle company; Grout Sealer.](#)
    - b. [Bostik, Inc.; CeramaSeal Grout & Tile Sealer, Magic Seal, Silox 8, or Siloxane 220.](#)
    - c. [C-Cure; Penetrating Sealer 978.](#)
    - d. [Custom Building Products; Surfaceguard Grout and Tile Sealer.](#)
    - e. [Jamo Inc.; Matte Finish or Penetrating Sealer.](#)
    - f. [MAPEI Corporation; KER 003, Silicone Spray Sealer for Cementitious Tile Grout or 004, Keraseal Penetrating Sealer for Unglazed Grout and Tile.](#)
    - g. [Southern Grouts & Mortars, Inc.; Silicone Grout Sealer.](#)
    - h. [Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and Tile Sealer.](#)
    - i. [TEC, a subsidiary of H. B. Fuller Company; TA-256 Penetrating Silicone or TA-257 Silicone Grout Sealer.](#)

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
  - 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

### 3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- C. Blending: For tile exhibiting color variations, use factory blended tile or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

### 3.3 INSTALLATION

- A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
  - 1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
    - a. Tile floors in wet areas.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. 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, fixtures, and other penetrations so plates, collars, or covers overlap tile.

- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
- F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
  - 1. Ceramic Mosaic Tile: 1/16 inch.
  - 2. Glazed Wall Tile: 1/16 inch.
- G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
  - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
  - 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- I. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
  - 1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).
- J. Grout Sealer: Apply grout sealer to grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.
- K. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.

### 3.4 INTERIOR TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations, Concrete Subfloor:
  - 1. Tile Installation F125A: Thin-set mortar on crack isolation membrane; TCA F125A.
    - a. Tile Type: CT-1.
    - b. Thin-Set Mortar: Latex-portland cement mortar.
    - c. Grout: Standard sanded cement.

B. Interior Wall Installations, Masonry:

1. Tile Installation W202: Thin-set mortar; TCA W202.
  - a. Tile Type: CT-2
  - b. Thin-Set Mortar: Latex-portland cement mortar.
  - c. Grout: Standard sanded cement.

END OF SECTION 093000



**SECTION 096519  
RESILIENT TILE FLOORING**

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. Resilient floor tile.
  - 2. Wall base.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of resilient floor tile.
  - 1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
  - 2. Show details of special patterns.
- C. Samples: Full-size units of each color, texture, and pattern of floor tile required.
- D. Samples for Initial Selection: For each type of floor tile indicated.
- E. Samples for Verification: Full-size units of each color and pattern of floor tile required.
- F. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

## 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

## 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

## 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
  - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces. Store flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

## 1.9 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F or more than 95 deg F, in spaces to receive floor tile during the following periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

## 1.10 WARRANTY

- A. Resilient Flooring: Submit a written warranty executed by the manufacturer, agreeing to repair or replace resilient flooring that fails within the warranty period.
- B. Limited Warranty Period: 5 years

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
  - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
  - 2. ASTM E 662 (Smoke Generation) Maximum Specific Optical Density of 450 or less

### 2.2 RESILIENT FLOOR TILE MATERIALS

- A. Manufacturers: Basis of Design provide products by Armstrong Flooring, Inc.
  - 1. Other manufactures subject to compliance with requirements, products by one of the following manufacturers may be submitted under the provisions of Division 01, Substitution Procedures.
- B. Basis of Design: Striations BBT and Migrations BBT Bio-Flooring manufactured by Armstrong.
  - 1. Description: Tile composed of polyester resin binder, fillers and pigments with colors and pattern dispersed uniformly throughout its thickness.
  - 2. Bio-flooring tile shall conform to the requirements of ASTM F 2982 Standard Specification for Polyester Composition Floor Tile. Note: Striations BBT™ and Migrations® BBT™ Bio-flooring's unique binder system does not contain polyvinyl chloride resins and plasticizers.
  - 3. Size: 12 in. x 12 in.
  - 4. Thickness: 1/8"/0.125 in. (3.2mm)
- C. Colors and Patterns: to be selected from manufacturer's color options and per floor patterns shown in drawings.

## 2.3 WALL BASE MATERIALS

- A. For top set wall base: Provide 1/8 in. thick, 4 in. high Armstrong Flooring Color-Integrated Wall Base with a matte finish, conforming to ASTM F 1861, Type TP - Rubber, Thermoplastic, Group 1 - Solid, Style B – Cove.
- B. Colors and Patterns: to be selected from manufacturer's color options.

## 2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
- C. Provide transition/reducing strips tapered to meet abutting materials.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, with Installer and the Manufacturer's Representative present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
  - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.

3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than **9** pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
  - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
  - b. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum **75** percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.
  1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

### 3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
  1. Lay tiles in pattern indicated on drawings.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
  1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern).
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

### 3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
  - 1. Remove adhesive and other blemishes from surfaces.
  - 2. Sweep and vacuum surfaces thoroughly.
  - 3. Damp-mop surfaces to remove marks and soil.
  - 4. Apply 3 to 5 coats of high-quality commercial floor polish, such as Armstrong Flooring S-480 Commercial Floor Polish. If the floor has already been stripped (due to construction traffic), the application of a stain resistant sealer (such as Armstrong Flooring S-495 Commercial Floor Sealer) prior to the application of polish, is recommended in areas that will be exposed to heavy traffic and/or staining agents.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover floor tile until Substantial Completion.
- E. Manufacturer's Field Representation to include providing cleaning and maintenance training and demonstration to Philadelphia Parks and Recreation Department's staff. Manufacturer's Representative to confirm in writing that the installation meets manufacturer's installation and cleaning recommendations at completion

END OF SECTION 096519

**SECTION 096813**  
**TILE CARPETING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section includes modular, tufted carpet tile.

**1.2 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site.

**1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show the following:
  - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
  - 2. Type of subfloor.
  - 3. Type of installation.
  - 4. Pattern of installation.
  - 5. Pattern type, location, and direction.
  - 6. Pile direction.
- C. Samples: For each exposed product and for each color and texture specified.

**1.4 INFORMATIONAL SUBMITTALS**

- A. Product test reports.
- B. Sample warranty.

**1.5 CLOSEOUT SUBMITTALS**

- A. Maintenance data.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.
- B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104.

## 1.8 FIELD CONDITIONS

- A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

## 1.9 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
  - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
  - 2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, loss of tuft bind strength, loss of face fiber, delamination.
  - 3. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 CARPET TILE CPT-1

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Shaw Contract Group.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings.
- C. Color: 08530 Skylight.
- D. Pattern: Purpose Tile 5T209.
- E. Fiber Content: 100 percent nylon 6.
- F. Pile Characteristic: Multi-Level Pattern Loop.



- G. Density: 5040 oz./cu. yd.
- H. Pile Thickness: 0.1 inch for finished carpet tile.
- I. Stitches: 9.5 per inch.
- J. Gage: 1/10 inch.
- K. Total Weight: 14 oz./sq. yd. for finished carpet tile.
- L. Primary Backing/Backcoating: Synthetic.
- M. Secondary Backing: Strataworx Tile.
- N. Size: 24 by 24 inches.
- O. Install Layout: Ashlar.
- P. Applied Soil-Resistance Treatment: SSP Shaw Soil Protection.
- Q. Performance Characteristics: As follows:
  - 1. Appearance Retention Rating: Moderate traffic, 2.5 minimum according to ASTM D 7330.
  - 2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.
  - 3. Dry Breaking Strength: Not less than 100 lbf according to ASTM D 2646.
  - 4. Tuft Bind: Not less than 3 lbf according to ASTM D 1335.
  - 5. Delamination: Not less than 3.5 lbf/in. according to ASTM D 3936.
  - 6. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
  - 7. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
  - 8. Resistance to Insects: Comply with AATCC 24.
  - 9. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
  - 10. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) according to AATCC 16, Option E.
  - 11. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.
  - 12. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.
  - 13. Emissions: Provide carpet tile that complies with testing and product requirements of CRI's "Green Label Plus" program.
  - 14. Emissions: Provide carpet tile that complies with the product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

## 2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
  - 1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Preparation: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- E. Installation: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- F. Installation Method: As recommended in writing by carpet tile manufacturer.
- G. Maintain dye lot integrity. Do not mix dye lots in same area.
- H. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- I. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- J. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- K. Install pattern parallel to walls and borders.
- L. Perform the following operations immediately after installing carpet tile:
  - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.

2. Remove yarns that protrude from carpet tile surface.
  3. Vacuum carpet tile using commercial machine with face-beater element.
- M. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

END OF SECTION 096813

## Paint Color Guide

*Paint Type/Company    Paint Name    Number    Finish    Used on    Technique*

### PARK GREEN (same as CCD Streetscape and Parkway Green)

<b>Sign Paints</b>	PPG Corafon	Dark Green	ADS5238020	20% Gloss	Parkway signs	Spray & Bake
	Matthews	Depth of Green	MP12435	Satin	CCD Transit Portal Poles	Sprayed-on enamel similar to automotive finish
	Matthews	Cityscape Green	R84020			Industrial enamel?
<b>Industrial Enamel Paint / Acrylic Trim Enamel</b>	MAB & Sherwin-Williams	Seashore - Ebony Green	24-660 or MAB 660		Bollards, bike racks, etc.	More durable than Matthews - used where people & objects will come into contact with painted surface and/or where you have a need to repaint
	<i>Competitor:</i> Axo Nobel		colormap			
<b>Powder Coating</b>	Dupont	Allestra Powder Coating	see RAL code below		benches, other street furnishings made in a factory	apply dry, electrically charge it to get it to stick, and then bake
	Spraylat		see RAL code below		" " "	" "
<b>* RAL Code</b>	RAL*	Fur Green	6009	< Darren & Seth think this is a better match		
	RAL*	Black Green	6012	< David Kanthor @ CCD gave this number, chosen by Joel Katz		

\*RAL = International paint numbers - used for powder coating. More info available from Tiger Drylac ([www.tiger-coatings.us](http://www.tiger-coatings.us))

*Paint Type/Company    Paint Name    Number    Finish    Used on    Technique*

### PARK BROWN

<b>Sign Paints</b>	PPG Corafon	Clydesdale Brown	ADS4343020	20% Gloss	Water Works signs	Spray & Bake
	Matthews	Urban Sign will provide (5/3)			Boxers' Trail signs	Sprayed-on enamel similar to automotive finish
<b>* RAL Code</b>	RAL*	Oxide Red	3009	<<< Need to confirm with samples		
	RAL*	Nut Brown	8011 or 8012	<<< Need to confirm with samples		

\*RAL = International paint numbers - used for powder coating. More info available from Tiger Drylac ([www.tiger-coatings.us](http://www.tiger-coatings.us))

## SECTION 099113 - EXTERIOR PAINTING

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
  - 1. Clay masonry.
  - 2. Concrete masonry units (CMU).
  - 3. Steel.
  - 4. Galvanized metal.
  - 5. Aluminum (not anodized or otherwise coated).

## 1.2 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples: For each type of paint system and each color and gloss of topcoat.
- C. Product List: For each product indicated. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.

## 1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

#### 1.5 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
    - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
    - b. Other Items: Architect will designate items or areas required.
  2. Final approval of color selections will be based on mockups.
    - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in other Part 2 articles for the paint category indicated.

#### 2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
  1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.
- D. Colors: As selected by Architect from manufacturer's full range.
- E. All Exterior exposed ferrous metal surfaces to be painted except for stainless steel items and unless noted otherwise. Anodized aluminum surfaces are not to be painted; and galvalume roofing materials are to be supplied with manufacturer's finishes and are not to be painted.

Follow the attached Philadelphia Parks and Rec Paint Color Guide. Use anti-graffiti coating and Low VOC paints.

- F. Direct to Metal paint systems in the same number of coats by Sherwin Williams or Benjamin Moore can be used in lieu of the Tnemec products specified below. Exterior Painting for applications not covered by the Paint Color Guide shall conform to the following minimum standards:

### 2.3 BLOCK FILLERS

- A. Block Filler, Latex, Interior/Exterior:
  - 1. Moorcraft; Supercraft Latex Block Filler #285.

### 2.4 PRIMERS/SEALERS

- A. Vinyl Acid Wash
  - 1. #760 line or Galva-Prep Phosphoric acid wash.

### 2.5 METAL PRIMERS

- A. Unprimed Ferrous - Primer, Aromatic Urethane, Zinc Rich.
  - 1. Tnemec; Tneme Zinc Series 90-97.
- B. Ferrous Galvanized - Primer and finish coat, Polyamide Epoxy.
  - 1. Tnemec; Tneme-Fascure Series 161.
- C. Non-Ferrous - Primer, DTM Acrylic:
  - 1. M. A. B. Paint; Rust-O-Lastic Hydro-Prime II Acrylic (DTM) Maintenance Primer 073-189.

### 2.6 WATER-BASED PAINTS

- A. Latex, Exterior Low Luster (Gloss Level 2-4):
  - 1. Moorcraft; Superspec Low Lustre Latex Paint #185.
- B. Aliphatic Acrylic Polyurethane, Exterior Semi-Gloss (Gloss Level 5):
  - 1. Tnemec; Endura-Shield II Series 1075.
- C. Aliphatic Polyurethane, Anti-Graffiti Coating:

1. Genesis Coatings; GCP 1000.

## 2.7 SOLVENT-BASED PAINTS

- A. Alkyd, Exterior Gloss (Gloss Level 6):

1. M. A. B. Paint; Rust-O-Lastic Finish Coating #074.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  1. Concrete: 12 percent.
  2. Masonry (Clay and CMU): 12 percent.
  3. Wood: 15 percent.
  4. Portland Cement Plaster: 12 percent.
  5. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
  1. Application of coating indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.
- B. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

### 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."



- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

### 3.4 CLEANING AND PROTECTION

- A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.5 EXTERIOR PAINTING SCHEDULE

#### A. Clay-Masonry Substrates:

- 1. See CMU.

#### B. CMU Substrates:

##### 1. Latex System:

- a. Prime Coat: Block filler, latex, interior/exterior.
- b. Intermediate Coat: Latex coat matching topcoat.
- c. Topcoat: Latex, exterior, low luster (Gloss Level 2-4).

#### C. Ferrous Metal – Unprimed Substrates:

##### 1. Water-Based Light Industrial Coating System:

- a. Prime Coat: Primer, Aromatic Urethane, Zinc Rich @ 2.5 - 3.5 mil dry thickness.
- b. Intermediate Coat: Primer and finish coat, Polyamide Epoxy. Slightly tinted to another shade than the final finish coat @ 3.0 - 5.0 mil dry thickness.
- c. Topcoat: Aliphatic Acrylic Polyurethane, Exterior Semi-Gloss (Gloss Level 5) @ 2.0 - 3.0 mil dry thickness.

#### D. Ferrous Metal - Galvanized Substrates:

##### 1. Water-Based Light Industrial Coating System:

- a. Prime Coat: Primer and finish coat, Polyamide Epoxy @ 3.0 - 5.0 mil dry thickness.
- b. Topcoat: Aliphatic Acrylic Polyurethane, Exterior Semi-Gloss (Gloss Level 5) @ 2.0 - 3.0 mil dry thickness.

#### E. Ferrous Metal – Shop Primed Substrates:

##### 1. Water-Based Light Industrial Coating System:

- a. Prime Coat: Primer and finish coat, Polyamide Epoxy @ 3.0 - 5.0 mil dry thickness.
- b. Topcoat: Aliphatic Acrylic Polyurethane, Exterior Semi-Gloss (Gloss Level 5) @ 2.0 - 3.0 mil dry thickness.

F. Non-Ferrous Metal - Unprimed Aluminum Substrates:

1. Alkyd System:

- a. Pre-Treatment: Vinyl Acid Wash.
- b. Prime Coat: Primer, DTM Acrylic.
- c. Intermediate Coat: Exterior alkyd coat matching topcoat. Slightly tinted to another shade than the final finish coat.
- d. Topcoat: Alkyd, Exterior Gloss (Gloss Level 6).
- e. Protection Coat: Aliphatic Polyurethane, Anti-Graffiti Coating.

END OF SECTION 099113

**SECTION 099123**  
**INTERIOR PAINTING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section includes surface preparation and the application of paint systems on interior substrates, including, but not limited to, the following:
  - 1. Clay masonry.
  - 2. Concrete masonry units (CMU).
  - 3. Steel.
  - 4. Galvanized metal.
  - 5. Aluminum (not anodized or otherwise coated).
  - 6. Wood.
  - 7. Gypsum board.
  - 8. Plaster.

**1.2 DEFINITIONS**

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

**1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples: For each type of paint system and in each color and gloss of topcoat.

- C. Product List: For each product indicated. Include printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

#### 1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

#### 1.5 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
    - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
    - b. Other Items: Architect will designate items or areas required.
  - 2. Final approval of color selections will be based on mockups.
    - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in other Part 2 articles for the paint category indicated.

#### 2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
  - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
1. Flat Paints and Coatings: 50 g/L.
  2. Nonflat Paints and Coatings: 150 g/L.
  3. Dry-Fog Coatings: 400 g/L.
  4. Primers, Sealers, and Undercoaters: 200 g/L.
  5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
  6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
  7. Pretreatment Wash Primers: 420 g/L.
- D. Colors: As selected by Architect from manufacturer's full range.

### 2.3 BLOCK FILLERS

- A. Block Filler, Latex, Interior/Exterior:
1. Moorcraft; Supercraft Latex Block Filler #285.

### 2.4 PRIMERS/SEALERS

- A. Vinyl Acid Wash:
1. #760 line or Galva-Prep Phosphoric acid wash.
- B. Latex Primer:
1. Benjamin Moore Standard.
- C. Water-Based Epoxy Primer:
1. Benjamin Moore Standard.
- D. Alkyd Wood Primer:
1. M. A. B. Paint; Alkyd Sealer Undercoater 037-172.

### 2.5 METAL PRIMERS

- A. Unprimed / Primed Ferrous – Primer and finish, DTM Acrylic:
1. Benjamin Moore I.M.C. DTM Alkyd Semi-Gloss M24.

- B. Ferrous Galvanized - Primer, DTM Galvanized:
  - 1. Benjamin Moore I.M.C. DTM M15.
- C. Non-Ferrous - Primer, DTM Acrylic:
  - 1. M. A. B. Paint; Rust-O-Lastic Hydro-Prime II Acrylic (DTM) Maintenance Primer 073-189.

## 2.6 WATER-BASED PAINTS

- A. Latex, Interior/Exterior Low Luster (Gloss Level 2-4):
  - 1. Moorcraft; Superspec Low Lustre Latex Paint #185.
- B. Latex, Interior Semi-Gloss (Gloss Level 5):
  - 1. Benjamin Moore Standard.
- C. Water-Based Epoxy, Interior Semi-Gloss (Gloss Level 5):
  - 1. Benjamin Moore Standard.

## 2.7 SOLVENT-BASED PAINTS

- A. Alkyd, Interior Semi-Gloss (Gloss Level 5):
  - 1. M. A. B. Paint; Rust-O-Lastic Finish Coating #074.

## EXECUTION

### 2.8 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Concrete: 12 percent.
  - 2. Masonry (Clay and CMU): 12 percent.
  - 3. Wood: 15 percent.
  - 4. Gypsum Board: 12 percent.
  - 5. Plaster: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
  - 1. Application of coating indicates acceptance of surfaces and conditions.

## 2.9 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

## 2.10 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

## 2.11 CLEANING AND PROTECTION

- A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

## 2.12 INTERIOR PAINTING SCHEDULE

- A. Clay-Masonry Substrates:
  - 1. See CMU.
- B. CMU Substrates:

1. Latex System:
  - a. Prime Coat: Block filler, latex, interior/exterior.
  - b. Intermediate Coat: Latex, interior/exterior, low luster (Gloss Level 2-4).
  - c. Topcoat: Latex, interior/exterior, low luster (Gloss Level 2-4).
  
- C. Ferrous Metal – Unprimed Substrates:
  1. Alkyd Primer System:
    - a. Prime Coat: Primer and finish, DTM Interior Alkyd Semi-Gloss (Gloss Level 5) @ 2.0 mil dry thickness.
    - b. Intermediate Coat: Primer and finish, DTM Interior Alkyd Semi-Gloss (Gloss Level 5) @ 2.0 mil dry thickness.
    - c. Topcoat: Primer and finish, DTM Alkyd Semi-Gloss (Gloss Level 5) @ 2.0 mil dry thickness.
  
- D. Ferrous Metal – Shop Primed Substrates:
  1. Alkyd Primer System:
    - a. Prime Coat: Primer and finish, DTM Interior Alkyd Semi-Gloss (Gloss Level 5) @ 2.0 mil dry thickness.
    - b. Topcoat: Primer and finish, DTM Interior Alkyd Semi-Gloss (Gloss Level 5) @ 2.0 mil dry thickness.
  
- E. Ferrous Metal – Galvanized Substrates:
  1. Water-Based Light Industrial Coating Over Waterborne Primer System:
    - a. Prime Coat: Primer, DTM galvanized, water based. @ 2.0 mil dry thickness.
    - b. Intermediate Coat: Finish, DTM Acrylic Semi-Gloss (Gloss Level 5) @ 2.0 mil dry thickness.
    - a. Topcoat: Finish, DTM Acrylic Semi-Gloss (Gloss Level 5) @ 2.0 mil dry thickness.
  
- F. Non-Ferrous Unprimed (Aluminum/Galvanized) Substrates:
  1. Alkyd System:
    - a. Pre-Treatment: Vinyl Acid Wash.
    - b. Prime Coat: Primer, DTM Interior Acrylic.
    - c. Intermediate Coat: Interior alkyd coat matching topcoat.
    - d. Topcoat: Alkyd, Interior Gloss (Gloss Level 6).
  
- G. Wood (Painted) Substrates:



1. Alkyd System:
  - a. Prime Coat: Wood Primer sealer, Interior Alkyd.
  - b. Intermediate Coat: Interior Alkyd Gloss (Gloss Level 6).
  - c. Topcoat: Alkyd, interior, gloss (Gloss Level 6).

H. Gypsum Board Substrates:

1. Impact-Resistant Latex System:
  - a. Prime Coat: Primer, latex, interior.
  - b. Intermediate: Finish, latex, interior, semi-gloss, (Gloss Level 5).
  - c. Topcoat: Finish, latex, interior, semi-gloss, (Gloss Level 5).
2. Moisture-Resistant Epoxy System:
  - a. Prime Coat: Primer, epoxy.
  - b. Intermediate Coat: Finish, epoxy.
  - c. Topcoat: Finish, epoxy.

END OF SECTION 099123

**SECTION 100610  
EXTERIOR SIGNAGE**

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 exterior site signage, including Building Identification, Park Identification, Pool Rules and Regulations, and Field Rules and Regulations.

1.3 REFERENCES

- A. Philadelphia Parks and Recreation (PPR) Signage Standard Manual.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Ziehler Playground, 200-64 E. Olney Avenue, Philadelphia, PA 19120.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of sign.
  - 1. Include plans, elevations, sections, and large-scale details of sign construction, wording, and lettering layout. Show anchorages and accessory items. Provide graphic layouts of each individual sign face and message for each sign location. Show fabrication and installation details, including all sign components such as: extrusions, brackets, bracing, hardware, internal framing, etc. Alphabet of each type style required by the contract documents; upper and lowercase, with numerals, punctuation and accents. Shop drawings MUST include all field verified conditions and dimensions. Show installation and mounting heights.
- C. Samples: Samples shall be clearly labeled on the back (where possible), designating item number, name of manufacturer, sign type and location. Fabricator shall submit a minimum of two (2) samples of each color and finish applied on each material type as indicated in the drawing package. Samples should represent the final finish of each element and will be used as control samples for production approval. Samples should represent extreme variations in color

and texture that might occur during fabrication. Please submit the following samples as specified in the drawing package:

1. Color Samples for each specified color, process and finish per PPR Signage Standard Manual. Color submittals shall be submitted on each relevant substrate.
2. Material Samples of each specified Material in each color and finish specified per PPR Signage Standard Manual. Submit manufacturer's standard color palette for color and finish selection.
3. Custom High Pressure Laminate (CHPL) manufacturer must supply project-specific electronic PDF proof for content approval and minimum 8" x 10" x .060" actual material lab samples for color and finish approval from production-ready digital art work and specifications as provided by PPR Signage Standards Manual.
4. Paper Templates: Templates should be fully assembled or have complete registration marks for assembly. Fabricator shall provide to PPR and Landscape Architect full-size paper templates for review and approval in the field of the following sign types:
  - a. PID.4.p
  - b. SID.1.f
  - c. PLY.1.p
  - d. RUL.6
5. PPR and Landscape Architect reserves the right to reject any submittal that does not satisfy the requirements. Fabricator shall submit additional drawings/samples as required to obtain final approval.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Fabricator and Installer.
- B. Material Certificates: For the following items:
  1. Shop finishes.

#### 1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For playground and fitness equipment and finishes to include in maintenance manuals.

#### 1.8 QUALITY ASSURANCE

- A. The Fabricator is required to submit as part of the submittal process additional qualifications for any subcontractors, including but not limited to, installers, electrician, specialty sub-contractor and/or project managers not included or accepted with the bid award of the project. PPR reserves the right to accept or reject any sub-contractor and/or project manager submitted for review. Qualifications should include: a minimum of 5-10 years relevant experience and shall provide information that illustrates the following:
  1. Fabricator and Installer Qualifications: A firm with a minimum of 5 years relevant experience. Fabricator must be approved by PPR. See Part 2 for approved vendors. At a minimum, submit the following:
  2. Firm/Personnel qualifications

3. Projects of similar size and complexity
  4. Demonstration of high-quality craftsmanship
  5. Project management team and experience.
- B. Work done and materials furnished shall meet the highest industry standards in every respect and, unless otherwise specified, materials and equipment shall be new and of the latest design.
- C. The Design Intent Package should provide everything necessary for a complete contract.
- D. In the event of conflict or omission, the Fabricator shall consult the Designer for resolution. All clarifications are to be made in writing in the form of an RFI from the Fabricator to the Designer.
- E. Use only personnel thoroughly skilled and experienced with the products and method for fabrication and installation of signage specified.
- F. The Owner shall reserve the right to reject any shop drawings, samples or other submittals, as well as any finished product or installation, that cannot meet the standard of quality established. Any such decision will be considered final and not subject to recourse.
- G. Materials and hardware not specified, but necessary to the complete functioning of the sign, shall conform to the quality level established.
- H. Substitutions of items specifically indicated in this specifications package that serve the same function with equal performance will be considered upon submission of substitution.

## 1.9 WARRANTY

- A. Warrant all products (including, but not limited to: materials, hardware and finishes) against any and all defects based on manufacturers' supplied warranties from date of installation. All manufacturer warranties should be submitted to the Landscape Architect and PPR for review.
1. Vinyl die-cut letters: warranted against delimitation from substrate.
  2. Paint finishes: warranted against fading or chalking, corrosion developing beneath paint surfaces of the support systems (except for obvious vandalism or other external damage to the paint surfaces).
  3. Corrosion of the fastenings.
  4. The signs not remaining true and plumb on their supports during normal wear.
  5. Fading of the colors when matched against a sample of the original color and material.
  6. Discoloration of metal finishes.
  7. Adhesives, e.g. tape and epoxy
  8. Paneling not remaining true and plumb on their supports during normal wear.
  9. CHPL
    - a. Manufacturer warrants that under normal wear and use the workmanship and materials used in the CHPL product purchased from the Manufacturer will meet the standards set forth on the applicable specification materials and that the product will not delaminate, peel, blister, crack or fade for a period ten (10) full years from the date of purchase.
    - b. In the event that the product does not perform as warranted:

- 1) Manufacturer shall be allowed to conduct an on-site inspection and investigation, or be provided digital images of defects
  - 2) Manufacturer shall work directly with the end-user to resolve any warranty matter,
  - 3) The sole remedy will be the repair or replacement of the defective product at the sole discretion of the Manufacturer, and/ or
  - 4) The repair or replacement by Manufacturer shall be limited to the re-manufacture and shipment of the replacement or repaired product to the site of the end-user's product.
- c. This warranty only applies to the manufacture and material used in the manufacture of the CHPL product. Manufacturer shall not be liable for any other costs, including but not limited to installation, labor or other costs or expenses. Any repair or replacement shall be warranted for a period up to the remaining life of the original warranty. Further the repair or replacement costs incurred by Manufacturer shall not exceed the purchase price paid for the product.
- B. The Fabricator shall correct any and all material and/ or workmanship defects which may appear during the warranty period by restoring defective work to the standard of the contract documents at no cost to the Owner and to the Owner's satisfaction. Corrections include, but are not limited to: disfiguring of any surface due to chalking, rusting, bubbling, or other disintegration of the sign face or of the messages or of the edge finish of the sign inserts or panel.
- C. Manufacturer warrants that under normal wear and use the installation and sign posts will not crack or fail for a period of one (10) years from the date of substantial completion.
- D. Installer shall provide labor and material warranty for a period of (1) full year from the date of substantial completion.

## PART 2 - PRODUCTS

### 2.1 FABRICATORS

- A. Source Limitations: Subject to compliance with requirements, approved Fabricator's include:
1. Urban Sign and Crane  
527 E. Chestnut Avenue  
Voorhees, NJ 08360  
856.691.8388  
[www.urbansigncompany.com](http://www.urbansigncompany.com)
  2. M.S. Signs, Inc.  
6 Morris Street  
Paterson, NJ 07501  
973.569.1111  
[www.mssign.com](http://www.mssign.com)

3. L&H Sign Company  
425 North 3<sup>rd</sup> Street  
Reading, PA 19601  
[www.lhsigns.com](http://www.lhsigns.com)
4. Compass Sign Co LLC  
1505 Ford Road  
Bensalem, PA 19020  
215.639.677  
[www.compass-sign.net](http://www.compass-sign.net)
5. Allied Environmental Signage  
69 Megill Road  
Farmingdale, NJ 07727  
732.751.1818  
[www.allied-signs.com](http://www.allied-signs.com)

## 2.2 EXTERIOR SITE SIGNAGE

- A. PID: PID.4.p Park Identification Sign, per PPR Signage Manual.
  1. Size: 55 1/8" L x 24" W.
  2. Text, Finishes, and Colors per PPR Signage Manual Requirements.
  3. Quantity: Two (2) Signs
  4. Installation: Post-mounted where shown on Drawings per PPR Signage Manual Requirements and Details.
- B. SID: SID.1.f Site Identification and Rules Sign, per PPR Signage Manual.
  1. Size: 49 1/8"L x 18" W.
  2. Text, Finishes, and Colors per PPR Signage Manual Requirements.
    - a. Sign 1 Text: "Court 1"
    - b. Sign 2 Text: "Court 2"
  3. Quantity: Two (2) Signs
  4. Installation: Mounted to fence where shown on Drawings per PPR Signage Manual Requirements and Details.
- C. PLY: PLY.1.p Playground Identification and Rules Sign, per PPR Signage Manual.
  1. Size: 45 1/8"L x 24" W.
  2. Text, Finishes, and Colors per PPR Signage Manual Requirements.
  3. Quantity: One (1) Sign
  4. Installation: Mounted to fence where shown on Drawings per PPR Signage Manual Requirements and Details.
- D. S8: RUL.6 Rules Sign, per PPR Signage Manual.
  1. Size: 12"L x 8" W.
  2. Text, Finishes, and Colors per PPR Signage Manual Requirements.
  3. Quantity: Two (2) Signs
    - a. (1) "No Smoking"

- b. (1) "No Littering"
4. Installation: Post-mounted where shown on Drawings per PPR Signage Manual Requirements and Details.

## 2.3 MATERIALS

### A. ALUMINUM

1. Aluminum shall be of best commercial quality and the various forms shall be straight and true. There shall be no scratches, scars or buckles. Size thickness and finish of aluminum shall be per NAAMM "Metal Finishes Manual". Comply with the following industry standards.
2. Aluminum sheets shall conform to ASTM B209 6061-T6
3. Aluminum extrusions shall conform to ASTM B241 6063 T6. Wall thickness shall be a minimum of 1/8" thick unless otherwise shown.
4. Brushed Finishes-Brush with abrasive of increasing grit# in a linear directional pattern.
5. Final surface shall have visible grain pattern to match sample approved by Designer. Spray with clear protective finish.
6. Polished Finish-Brush with abrasive of increasing grit #. Buff to a mirror finish with no visible grain. Match sample approved by Designer. Spray with clear protective finish.
7. Non-Directional Finish-Brush with abrasive mounted in a random orbital sander. Match sample approved by Designer. Spray with clear protective finish.

### B. STAINLESS STEEL

1. Structural Stainless steel shapes to be rolled or laser fused, as manufactured by Stainless Structural, LLC. (936-538- 7600, [www.stainless-structurals.com](http://www.stainless-structurals.com))
2. Chromium stainless steel sheet. Use type 304 or type 316 stainless steel with 16% chromium and 10% nickel.
3. For steel exposed to view on completion, provide materials having flat, smooth surfaces without blemishes. Do not use materials whose surfaces exhibit pitting, seam marks, roller marks, rolled trade names, or roughness. Stainless Steel Plate, Sheet and Strip: Provide stainless steel plate, sheet, or strip, AISI Type 302, complying with requirements of ASTM A 167.
4. Stainless Steel Finishes: Finish designations prefixed by "AISI" conform to the system established by the American Iron and Steel Institute for designating finishes.
5. Finish: Bead blasted & Pickled.

### C. CUSTOM HIGH PRESSURE LAMINATE

1. Provide Custom High pressure laminate as manufacturer by iZone or an approved equal.
2. Custom High Pressure Laminate material composed of required layers of phenolic resin impregnated brown kraft filler paper to produce specified thicknesses, surfaced by a layers of melamine overlay, graphics imaged on saturation grade paper with UV resistant pigment based process color inks, and with an optically clear UV overlay that will resist no less that 99% of all sunlight and UV rays, as well as provide a graffiti resistant surface that allows for removal with standard cleaners.
3. Layers of material are to be assembled, and heat/ pressure consolidated at approximately 1200 PSI at temperatures exceeding 275° Fahrenheit at manufacturer's prescribed time frames.

4. All manufacturing processes of printing, pressing, machining, finishing and crating to be accomplished within a single standalone manufacturing facility to ensure consistent quality control and providing standard product delivery times of three weeks.

D. WOOD

1. #1 grade black locust lumber. Sustainably harvested. Eased edges. Apply a UV clear coat to enhance the wood grain and provide additional protection.

E. REFLECTIVE GRAPHICS

1. Provide 3M Scotchlite enclosed lens reflective sheeting or approved equal.

F. VHB FOAM TAPES

1. Provide 3M Scotch VHB 4930
2. Adhesive shall be Acrylic VHB
3. Carrier shall be closed cell foam

G. ACCESSORIES ANCHORS AND FASTENINGS

1. Provide anchors and fasteners required to secure work in place. Do not expose fastenings on surface of sign panels unless specifically noted otherwise. Do not deform, distort or discolor sign face surfaces by attachment of concealed fastenings.
2. All fastenings shall be non-corrosive and resistant to oxidation or other corrosive action, of the same composition completely through their cross sections, particularly when used below grade. Use highest quality stainless steel hardware and fasteners.
3. Anchors, inserts or fasteners shall be compatible with sign materials, shall not result in galvanic action or chemical interaction of adhesives and shall have demonstrable and sufficient strength for intended use.
4. Steel anchors and fastenings for exterior use shall be galvanized in accordance with ASTM A153.
5. Fabricate and install signs with fastenings to withstand all actions imposed by use; 30 psf wind perpendicular to surfaces, water, ice, snow loads and similar forces.
6. Anchor bolts in concrete shall be cast in place. Fabricator shall furnish instructions for the setting of anchors and bearing plates. Fabricator shall ascertain that the items are properly set during the process of the work.
7. Secure work with fastenings of same color and finish as the components they secure where they are exposed to view, unless noted otherwise. All exposed fasteners must be vandal resistant and have vandal-proof "spanner" type slots to be removed only with a special driver head.

H. SELF HEALING TACK SURFACE

1. Provide tack surface as manufactured by Rubber Flooring Inc., or approved equal.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting performance of the Work.



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

### 3.2 INSTALLATION

- A. Install sign units and components with concealed fasteners unless otherwise shown. Refer to Drawings and PPR Signage Manual for general method of installation. Verify each surface in field to determine appropriate mounting hardware. Fabricator is responsible for determining where below ground or in-wall structural tie-ins may be required. All elements should be installed true and plumb in accordance with the design intent of this document. Sign location drawings show approximate locations of signs. Fabricator, Landscape Architect, and PPR shall conduct a pre-install mark out walk through to confirm all locations and identify areas of conflict. Fabricator is responsible for determining the location of underground structures and utilities on ground-mounted signs. Any conflicts should be brought to the attention of the PPR and Landscape Architect.

### 3.3 REGULATORY REQUIREMENTS

- A. All installation work shall comply with applicable municipal, state and federal codes, sign ordinances and ADA guidelines for handicapped and fire/life safety signing.
- B. All OSHA safety requirements will be implemented during fabrication and installation as needed or required to comply with safety regulations.
- C. All field/site work shall be conducted in compliance with the Owner/Construction Manager's requirements/ regulations for the site, particularly areas open and accessible to the public. Work area protection shall be required as needed and all site-specific rules should be reviewed and outlined during the project kick-off meeting.

### 3.4 CLEAN UP

- A. Daily and upon completion of installation remove all waste, dirt, wrappings and excess materials, tools and equipment, and thoroughly clean all surfaces to the satisfaction of PPR.

### 3.5 REORDERING

- A. Reordering all items specified in this package shall be available to the Owner in additional quantities for a period of 10 years after completion of all work called for in this specification.

END OF SECTION 100610

## **SECTION 101200**

### **DISPLAY CASES**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Nonilluminated bulletin boards.

##### **1.2 DEFINITIONS**

- A. Bulletin Board: Tackable visual display surface.

##### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For display cases. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Show location of seams and joints in visual display surfaces.
  - 2. Include sections of typical trim members.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Delegated-Design Submittal: For display cases indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Qualified professional must be licensed / registered in State of Pennsylvania.

##### **1.4 INFORMATIONAL SUBMITTALS**

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of fabrics.

##### **1.5 CLOSEOUT SUBMITTALS**

- A. Maintenance Data: For visual display surfaces to include in maintenance manuals.

## 1.6 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: 25 or less.
  - 2. Smoke-Developed Index: 50 or less.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Hardboard: ANSI A135.4, tempered.
- B. Natural Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish.
- C. Fasteners: Provide screws, bolts, and other fastening devices made from same material as items being fastened. Provide types, sizes, and lengths to suit installation conditions. Use security fasteners where exposed to view.
- D. Adhesives: Manufacturer's standard product that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

### 2.2 TACKBOARD ASSEMBLIES

- A. Natural-Cork Tackboard: 1/4-inch-thick, natural cork sheet factory laminated to 1/4-inch-hardboard backing.

### 2.3 BULLETIN BOARD

- A. **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. Nonilluminated Bulletin Boards:
    - a. [A-1 Visual Systems.](#)
    - b. [AARCO Products, Inc.](#)
    - c. [ADP Lemco, Inc.](#)
    - d. [APCO Graphics, Inc.](#)
    - e. [Aywon.](#)
    - f. [Best-Rite Manufacturing.](#)
    - g. [Claridge Products and Equipment, Inc.](#)

- h. [Ghent Manufacturing, Inc.](#)
  - i. [Marsh Industries, Inc.; Visual Products Group.](#)
  - j. [Nelson-Harkins Industries.](#)
  - k. [Peter Pepper Products, Inc.](#)
  - l. [Platinum Visual Systems; a division of ABC School Equipment, Inc.](#)
  - m. [Poblocki Sign Company.](#)
  - n. [PolyVision Corporation; a Steelcase company.](#)
  - o. [Tablet & Ticket Co. \(The\).](#)
  - p. [Tri-Best Visual Display Products.](#)
- B. General: Factory-fabricated unit consisting of manufacturer's standard wall-mounted cabinet with tackboard assembly on back inside surface and operable glazed doors at front.
  - C. Wood-Framed Cabinet: Manufacturer's standard species with natural lacquered finish.
  - D. Cabinet Corners: Square.
  - E. Tack Surface: Natural-cork tackboard assembly.
    - 1. Color: As selected by Architect from full range of industry colors.
  - F. Mounting: Surface mounted.

#### 2.4 FABRICATION

- A. Fabricate bulletin boards to requirements indicated for dimensions, design, and thickness and finish of materials.
- B. Use metals and shapes of thickness and reinforcing to produce flat surfaces, free of oil-canning, and to impart strength for size, design, and application indicated.
- C. Fabricate cabinets and door frames with reinforced corners, mitered to a hairline fit, with no exposed fasteners.
- D. Fabricate shelf standards plumb and at heights to align shelf brackets for level shelves.

#### 2.5 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
- B. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker.
- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Install units in locations and at mounting heights indicated on Drawings. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
- B. Bulletin Boards: Attach units to wall surfaces with concealed fasteners through back of cabinet.

END OF SECTION 101200

## **SECTION 101423**

### **PANEL SIGNAGE**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Panel signs.
  - 2. Room-identification signs.

##### **1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Shop Drawings: For panel signs.
  - 1. Include fabrication and installation details and attachments to other work.
  - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
  - 3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
  - 4. Show locations of electrical service connections.
  - 5. Include diagrams for power, signal, and control wiring.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Sign Schedule: Use same designations specified or indicated on sign schedule drawing A9.03.

##### **1.3 INFORMATIONAL SUBMITTALS**

- A. Sample warranty.

##### **1.4 CLOSEOUT SUBMITTALS**

- A. Maintenance data.

##### **1.5 WARRANTY**

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.
  1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- B. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for signs.

### 2.2 SIGNS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:
  1. [Ace Sign Systems, Inc.](#)
  2. [Advance Corporation](#); Braille-Tac Division.
  3. [Allen Industries, Inc.](#)
  4. [Allen Markings International.](#)
  5. [APCO Graphics, Inc.](#)
  6. [ASE, Inc.](#)
  7. [ASI Sign Systems, Inc.](#)
  8. [Best Sign Systems Inc.](#)
  9. [Bunting Graphics, Inc.](#)
  10. [Clarke Systems.](#)
  11. [Diskey Sign Company.](#)
  12. [Fossil Industries, Inc.](#)
  13. [InPro Corporation.](#)
  14. [Mohawk Sign Systems.](#)
  15. [Nelson-Harkins Industries.](#)
  16. [Poblocki Sign Company, LLC.](#)
  17. [Seton Identification Products.](#)
  18. [Supersine Company \(The\)](#); Division of Stamp-Rite, Inc.
  19. [Vista System.](#)
  20. [Vomar Products, Inc.](#)
- C. Room-Identification Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated to acrylic backing sheet to produce composite sheet.
  - a. Composite-Sheet Thickness: Manufacturer's standard for size of sign.
  - b. Surface-Applied Graphics: Applied paint.
  - c. Color(s): As selected by Architect from manufacturer's full range.
2. Sign-Panel Perimeter: Finish edges smooth.
  - a. Edge Condition: Square cut.
  - b. Corner Condition in Elevation: Rounded to 1/4" radius.
3. Mounting: Surface mounted to wall with security countersunk flathead through fasteners, adhesive, or two-face tape.

### 2.3 PANEL-SIGN MATERIALS

- A. Polycarbonate Sheet: Coated, mar-resistant, UV-stabilized polycarbonate, with coating on both sides.

### 2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
  1. Use concealed fasteners and anchors unless indicated to be exposed.
  2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
  3. Exposed Metal-Fastener Components, General:
    - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
  4. Sign Mounting Fasteners:
    - a. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, installed in predrilled holes.
- B. Adhesives: As recommended by sign manufacturer and with a VOC content of 70 g/L or less for adhesives used inside the weatherproofing system and applied on-site when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.



## 2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
  - 1. Internally brace signs for stability and for securing fasteners.
  - 2. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
- B. Surface-Engraved Graphics: Machine engrave characters and other graphic devices into panel surface indicated to produce precisely formed copy, incised to uniform depth.
  - 1. Engraved Opaque Acrylic Sheet: Fill engraved graphics with manufacturer's standard enamel.
- C. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted signs to suit sign construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.
  - 1. Stainless-Steel Brackets: Factory finish brackets with No. 4 finish unless otherwise indicated.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
  - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
  - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
  - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- B. Mounting Methods:
  - 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
    - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
    - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

2. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
    - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
    - b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.
  3. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
  4. Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position so that signage is correctly located and aligned.
  5. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
  6. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
- C. Remove temporary protective coverings and strippable films as signs are installed.

END OF SECTION 101423

**SECTION 102113**  
**PLASTIC TOILET COMPARTMENTS**

**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. Solid-plastic toilet compartments configured as toilet enclosures and urinal screens.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for supports that attach floor-and-ceiling-anchored compartments and post-to-ceiling screens to overhead structural system.
2. Section 102800 "Toilet Room Accessories" for toilet tissue dispensers, grab bars, and similar accessories mounted on toilet compartments.

**1.3 ACTION SUBMITTALS**

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings: For toilet compartments.

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of centerlines of toilet fixtures.
4. Show locations of floor drains.
5. Show ceiling-mounted items, and overhead support or bracing locations.

C. Samples for Initial Selection: For each type of toilet compartment material indicated.

1. Include Samples of hardware and accessories involving material and color selection.

D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:

1. Each type of material, color, and finish required for toilet compartments, prepared on 6-inch-square Samples of same thickness and material indicated for Work.
  2. Each type of hardware and accessory.
- E. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of toilet compartment.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet compartments to include in maintenance manuals.

#### 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents and source.
1. Door Hinges: two (2) hinges with associated fasteners.
  2. Latch and Keeper: Ten (10) latches and keepers with associated fasteners.
  3. Door Bumper: Ten (10) bumpers with associated fasteners.
  4. Door Pull: Four (4) door pulls with associated fasteners.
  5. Fasteners: Twenty (20) fasteners of each size and type.

#### 1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Santana Products Co.
- B. Bobrick Washroom Equipment, Inc.
- C. Bradley Corporation

## 2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: **75** or less.
  - 2. Smoke-Developed Index: 450 or less.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

## 2.3 SOLID-PLASTIC TOILET COMPARTMENTS

- A. Toilet-Enclosure Style: Floor and ceiling anchored.
- B. Entrance-Screen Style: Floor and ceiling anchored.
- C. Urinal-Screen Style: Post to ceiling.
- D. Door, Panel, Screen, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, no-sightline system, and with homogenous color and pattern throughout thickness of material.
  - 1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
  - 2. Heat-Sink Strip: Manufacturer's standard continuous, stainless-steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
  - 3. Color and Pattern: One color and pattern in each room as selected by Architect from manufacturer's full range
- E. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; stainless steel.
- F. Urinal-Screen Post: Manufacturer's standard post design of material matching the thickness and construction of pilasters; with shoe and sleeve (cap) matching that on the pilaster.
- G. Brackets (Fittings):
  - 1. Stirrup Type: Ear or U-brackets, stainless steel
  - 2. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

## 2.4 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.

1. Hinges: Manufacturer's minimum 0.062-inch-thick stainless-steel continuous, cam type that swings to a partially open position, allowing emergency access by lifting door. Mount with through-bolts.
  2. Latch and Keeper: Manufacturer's heavy-duty surface-mounted cast-stainless-steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts.
  3. Coat Hook: Manufacturer's heavy-duty combination cast-stainless-steel hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Mount with through-bolts. Provide hooks at maximum 48" height in accessible toilet compartments.
  4. Door Bumper: Manufacturer's heavy-duty rubber-tipped cast-stainless-steel bumper at out-swinging doors. Mount with through-bolts.
  5. Door Pull: Manufacturer's heavy-duty cast-stainless-steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

## 2.5 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M.
- B. Aluminum Extrusions: ASTM B 221.
- C. Brass Castings: ASTM B 584.
- D. Brass Extrusions: ASTM B 455.
- E. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- F. Stainless-Steel Castings: ASTM A 743/A 743M.
- G. Zamac: ASTM B 86, commercial zinc-alloy die castings.

## 2.6 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- C. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- D. Ceiling-Hung Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for connection to structural support above finished ceiling. Provide assemblies that support pilasters from structure without transmitting load to finished ceiling. Provide sleeves (caps) at tops of pilasters to conceal anchorage.
- E. Floor-and-Ceiling-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.
- F. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at tops and bottoms of posts. Provide shoes and sleeves (caps) at posts to conceal anchorage.
- G. Door Size and Swings: Unless otherwise indicated, provide 24-inch-wide, in-swinging doors for standard toilet compartments and 36-inch-wide, out-swinging doors with a minimum 32-inch-wide, clear opening for compartments designated as accessible.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
  - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:
    - a. Pilasters and Panels: 1/2 inch.
    - b. Panels and Walls: 1 inch.
  2. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel.
    - a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
    - b. Align brackets at pilasters with brackets at walls.
  3. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
    - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
    - b. Align brackets at pilasters with brackets at walls.
- B. Floor-and-Ceiling-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure pilasters to supporting construction and level, plumb, and tighten. Hang doors and adjust so doors are level and aligned with panels when doors are in closed position.
- C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

### 3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113



**SECTION 102800**  
**TOILET ROOM ACCESSORIES**

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. Public-use washroom accessories.
2. Staff bathroom accessories.
3. Warm-air dryers.
4. Childcare accessories.
5. Underlatory guards.
6. Custodial accessories.

B. Related Requirements:

1. Section 088300 "Mirrors" for frameless mirrors.
2. Section 102113 "Plastic Toilet Compartments" for mounting surfaces for accessories.

1.3 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Coordinate the work of this Section with the placement of internal wall reinforcement to receive inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
  - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
  - 3. Include electrical characteristics.
- B. Samples: Full size, for each exposed product and for each finish specified.
  - 1. Approved full-size Samples will be returned and may be used in the Work.
- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
  - 1. Identify locations using room designations indicated.
  - 2. Identify accessories using designations indicated.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranty.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For accessories to include in maintenance manuals.

#### 1.7 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, visible silver spoilage defects.
  - 2. Warranty Period: 15 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- 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.

### 2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.

- B. Manufacturers:

1. Bradley Corp., Menomonee Falls WI, 53051
2. Bobrick Washroom Equipment, Inc., Clifton Park, New York.
3. TrueBro Inc., Ellington, CT 06029

- C. Toilet Tissue Dispenser (TTD):

1. Bradley, one per Toilet Compartment.
2. Description: Unit with double-roll toilet tissue dispenser.
3. Mounting: Partition mounted, dual access with two tissue rolls per compartment or Partition mounted, dual access with two tissue rolls per compartment and with one side that mounts flush with partition of accessible compartment.
4. Toilet Tissue Dispenser Capacity: 4-1/2- or 5-inch-diameter tissue rolls.
5. Toilet Tissue Dispenser Operation: Controlled delivery with theft-resistant spindles.
6. Material and Finish: Stainless steel, No. 4 finish (satin) 18 guage.
7. Lockset: Tumbler type.

- D. Waste Receptacle (WR):

1. Bradley
2. Mounting: Open top, Semirecessed
3. Minimum Capacity: 4 Gallon (15 Liter)
4. Material and Finish: Stainless steel, No. 4 finish (satin)] 18 guage.

5. Liner: Reusable vinyl liner.
  6. Lockset: Tumbler type for waste receptacle.
- E. Liquid-Soap Dispenser (SD):
1. Bradley
  2. Description: Designed for dispensing soap in liquid form.
  3. Mounting: Horizontally oriented, surface mounted.
  4. Capacity: Min 12 oz.
  5. Materials: Stainless Steel. Retain "Lockset" and "Refill Indicator" subparagraphs below if required.
  6. Lockset: Tumbler type.
  7. Refill Indicator: Window type.
- F. Grab Bar (GB):
1. Bradley models 8122-00142 and 8122-00136
  2. Mounting: Flanges with concealed fasteners.
  3. Material: Stainless steel, 0.05 inch thick.
    - a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
  4. Outside Diameter: 1-1/2 inches.
  5. Configuration and Length: As indicated on Drawings, Straight, 36 inches long and Straight 48 inches long.
- G. Towel Pin (TP):
1. Bobrick Model No. B-677
  2. Description: Projecting minimum of 3 3/8 inches from mounting surface. 2x2 inch flange.
  3. Material and Finish: Stainless steel, No. 4 finish (satin) One per Restroom and one per Toilet Compartment.
- H. Mirror Unit (MU):
1. Bradley 7481

2. Framed Stainless Steel security mirror: fabricated of 20 gauge type 430 stainless steel, bright annealed. Stretcher leveled for uniform finish. Reflective surface is bright and smooth with a mirror like finish after being polished to a #8 architectural finish. One unit for each standard lavatory except Staff Toilet Room.
3. Frame: Stainless-steel channel.
  - a. Corners: Welded and ground smooth.
4. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
  - a. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
5. Size: 18x30 inches.

### 2.3 WARM-AIR DRYERS

- A. Source Limitations: Obtain warm-air dryers from single source from single manufacturer. One per two lavatories in Public Use Washrooms and one per Single User Bathroom including Staff Bathrooms.
- B. Multiple Airflow Warm-Air Dryer (HD):
  1. Dyson.
  2. Description: Multiple airflow warm-air hand dryer, using two or more airstreams for rapid hand drying.
  3. Mounting: Surface mounted, with low-profile design.
  4. Operation: Electronic-sensor activated with operation time of 10 seconds.
  5. Cover Material and Finish: Stainless steel, No. 4 finish (satin).
  6. Electrical Requirements: 115 V, 15 A, 1725 W.

### 2.4 UNDERLAVATORY GUARDS

- A. Underlavatory Guard (PG):
  1. TruBro
  2. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.

3. Material and Finish: Antimicrobial, molded plastic, white.

## 2.5 CUSTODIAL ACCESSORIES

- A. Source Limitations: Obtain custodial accessories from single source from single manufacturer.

- B. Utility Shelf (US):

1. Bobrick
2. Description: With exposed edges turned down not less than 1/2 inch and supported by two triangular brackets welded to shelf underside.
3. Size: 16 inches long by 6 inches deep
4. Material and Finish: Not less than nominal 0.05-inch-thick stainless steel, No. 4 finish (satin).

- C. Mop and Broom Holder (MH):

1. Bobrick
2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
3. Length: 36 inches.
4. Hooks: Four (4).
5. Mop/Broom Holders: Three (3), spring-loaded, rubber hat, cam type.
6. Material and Finish: Stainless steel, No. 4 finish (satin).
  - a. Shelf: Not less than nominal 0.05-inch-thick stainless steel.
  - b. Rod: Approximately 1/4-inch-diameter stainless steel.

## 2.6 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.

- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

## 2.7 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of **6** keys to Owner's representative.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

### 3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 102800

**SECTION 104413**  
**FIRE EXTINGUISHER CABINETS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section includes fire protection cabinets for fire extinguishers.

**1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each exposed product and for each color and texture specified.

**1.3 CLOSEOUT SUBMITTALS**

- A. Maintenance data.

**1.4 QUALITY ASSURANCE**

- A. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.
- B. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- C. Coordinate sizes and locations of fire protection cabinets with wall depths.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
- B. Acrylic Bubble: One piece.



## 2.2 FIRE PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
1. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following manufacturers:
    - a. [Fire End & Croker Corporation.](#)
    - b. [J. L. Industries, Inc., a division of Activar Construction Products Group.](#)
    - c. [Kidde Residential and Commercial Division, Subsidiary of Kidde plc.](#)
    - d. [Larsen's Manufacturing Company.](#)
    - e. [Modern Metal Products, Division of Technico Inc.](#)
    - f. [Moon-American.](#)
    - g. [Potter Roemer LLC.](#)
    - h. [Watrous Division, American Specialties, Inc.](#)
- B. Cabinet Construction: Nonrated.
1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-inch-thick, cold-rolled steel sheet lined with minimum 5/8-inch-thick, fire-barrier material. Provide factory-drilled mounting holes.
- C. Cabinet Material: Steel sheet.
- D. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.
- E. Cabinet Trim Material: Steel sheet.
- F. Door Material: Steel sheet.
- G. Door Style: Fully glazed panel with frame.
- H. Door Glazing: Break acrylic bubble.
1. Acrylic Bubble Color: Clear transparent.
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
- J. Accessories:
1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
  2. Break-Glass Strike: Manufacturer's standard metal strike, complete with chain and mounting clip, secured to cabinet.
  3. Door Lock: Cylinder lock.

4. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.
  - a. Identify fire extinguisher in fire protection cabinet with the words "[FIRE EXTINGUISHER]."
    - 1) Location: Applied to cabinet door and sides.
    - 2) Application Process: Decals.
    - 3) Lettering Color: White.
    - 4) Orientation: Vertical.

K. Finishes:

1. Manufacturer's standard baked-enamel paint for the following:
  - a. Exterior of cabinet door, and trim, except for those surfaces indicated to receive another finish.
  - b. Interior of cabinet and door.
2. Steel: Baked enamel or powder coat.
  - a. Color and Gloss: As selected by Architect from manufacturer's full range.

## 2.3 FABRICATION

- A. Fire Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Miter and weld joints and grind smooth.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install fire protection cabinets in locations and at mounting heights indicated.
- B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
- C. Identification: Apply decals at locations indicated.
- D. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

**SECTION 104416**  
**FIRE EXTINGUISHERS**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
- C. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Failure of hydrostatic test according to NFPA 10.

- b. Faulty operation of valves or release levers.
2. Warranty Period: Six years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each mounting bracket indicated.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. [Amerex Corporation.](#)
    - b. [Ansul Incorporated; Tyco International Ltd.](#)
    - c. [Badger Fire Protection; a Kidde company.](#)
    - d. [Buckeye Fire Equipment Company.](#)
    - e. [Fire End & Croker Corporation.](#)
    - f. [J. L. Industries, Inc.; a division of Activar Construction Products Group.](#)
    - g. [Kidde Residential and Commercial Division; Subsidiary of Kidde plc.](#)
    - h. [Larsen's Manufacturing Company.](#)
    - i. [Moon-American.](#)
    - j. [Pem All Fire Extinguisher Corp.; a division of PEM Systems, Inc.](#)
    - k. [Potter Roemer LLC.](#)
    - l. [Pyro-Chem; Tyco Safety Products.](#)
  2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.
- B. Regular Dry-Chemical Type: UL-rated nominal capacity, with sodium bicarbonate-based dry chemical in manufacturer's standard enameled container.

### 2.2 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. [Amerex Corporation.](#)
    - b. [Ansul Incorporated; Tyco International Ltd.](#)
    - c. [Badger Fire Protection; a Kidde company.](#)

- d. [Buckeye Fire Equipment Company.](#)
  - e. [Fire End & Croker Corporation.](#)
  - f. [J. L. Industries, Inc.; a division of Activar Construction Products Group.](#)
  - g. [Larsen's Manufacturing Company.](#)
  - h. [Potter Roemer LLC.](#)
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
- 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
    - a. Orientation: Vertical.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Examine fire extinguishers for proper charging and tagging.
  - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
  - 1. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.
- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

**SECTION 116623**  
**GYMNASIUM EQUIPMENT**

**PART 1 - GENERAL**

**1.1 SUMMARY**

**A. Section Includes:**

1. Boxing equipment.

**1.2 ACTION SUBMITTALS**

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

**B. Shop Drawings:** For gymnasium equipment.

1. Include plans, elevations, sections, details, and attachments to other work.

**C. Samples:** For each exposed product and for each item and color specified.

**1.3 INFORMATIONAL SUBMITTALS**

**A. Coordination Drawings:** Court layout plans, drawn to scale.

**B. Product certificates.**

**C. Sample warranty.**

**1.4 CLOSEOUT SUBMITTALS**

**A. Operation and maintenance data.**

**1.5 QUALITY ASSURANCE**

**A. Installer Qualifications:** Fabricator of products.

**1.6 WARRANTY**

**A. Special Warranty:** Manufacturer agrees to repair or replace components of gymnasium equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 BOXING EQUIPMENT

- A. **Manufacturers:** Subject to compliance with requirements, **available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:**
  1. Prolast.
  2. Pro Elite USA.
  3. USA Boxing Equipment.
- B. Description: Low profile, complete, ready-to-assemble professional grade boxing training ring with heavy gauge steel frame and corner posts, ring corner cushions, ropes and rope covers, turnbuckles, wood flooring, heavy gauge canvas ring cover, ring skirts.
- C. Dimensions: 21' x 21' maximum overall assembled dimension with minimum 18' x 18' clear boxing area. Approximate height of ring to adjacent floor 12".
- D. Materials:
  1. Steel framing: Provided by manufacturer.
  2. Wood framing: Provided by manufacturer.
  3. Cables, ropes, and hardware: Provided by manufacturer.
  4. Canvas floor and skirts: Provided by manufacturer.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Complete equipment field assembly where required.
- B. Permanently Placed Gymnasium Equipment and Components: Install rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated; in proper relation to adjacent construction; and aligned with court layout.
- C. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

3.2 CLEANING

- A. After completing gymnasium equipment installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.

3.3 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain gymnasium equipment.

END OF SECTION 116623



**SECTION 116800  
PLAY EQUIPMENT AND STRUCTURES**

**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 as follows:
  - 1. Playground Equipment manufactured by KOMPAN.
  - 2. Fitness Equipment manufactured by KOMPAN.
  - 3. Basketball Goal.

**1.3 DEFINITIONS**

- A. Definitions in ASTM F1487 apply to Work of this Section.
- B. IPEMA: International Play Equipment Manufacturers Association.

**1.4 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Ziehler Playground, 200-64 E. Olney Avenue, Philadelphia, PA 19120.
  - 1. Attendees to include KOMPAN Representative, General Contractor, and Equipment Installer.

**1.5 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of playground and fitness equipment.
  - 1. Include plans, elevations, sections, and attachment details.
  - 2. Include fall heights and use zones for playground and fitness equipment, coordinated with the critical-height values of protective surfacing specified in Section 321816.13 "Playground Protective Surfacing."
- C. Samples for Initial Selection: For each type of exposed finish.

1. KOMPAN color charts.
2. Include Samples of accessories involving color selection.

D. Samples for Verification: For each type of exposed finish on the following products:

1. Include Samples of accessories to verify color and finish selection.
2. Posts and Rails: Minimum 6 inches long.
3. Platforms: Minimum 6 inches square.
4. Molded Plastic: Minimum 3 inches square.

E. Product Schedules: For Playground Equipment and Fitness Equipment, use same designations as indicated on Drawings.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Product Certificates: For each type of playground and fitness equipment.
- C. Material Certificates: For the following items:
  1. Shop finishes.
- D. Field quality-control reports.
- E. Sample Warranty: For manufacturer's special warranties.

#### 1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For playground and fitness equipment and finishes to include in maintenance manuals.

#### 1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm whose playground and fitness equipment components have been certified by IPEMA's third-party product certification service.
  1. Playground and fitness equipment manufacturer must be approved by Philadelphia Parks and Recreation (PPR).
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

#### 1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of playground and fitness equipment that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
  - a. Structural failures.
  - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
2. KOMPAN Warranty Period:
  - a. Lifetime Warranty: galvanized structural parts including steel poles, cross beams, floor frames, and top brackets; stainless steel hardware; and EcoCore™ and other HDPE panels.
  - b. Ten (10) Year Warranty: HPL floors and panels; galvanized and aluminum metal parts with painted top layer; other galvanized metal parts; other stainless steel parts; Corocord rope; “S” clamps of stainless steel; solid plastic parts; hollow plastic parts; non-painted metal parts; Robinia & Siberian larch wood; and other engineered timber.
  - c. Five (5) Year Warranty: resin coated plywood plates; other painted metal parts; springs and ball bearing assemblies; other rope and net constructions; and concrete elements.
  - d. Two (2) Year Warranty: movable plastic and metal parts; EPDM rubber membranes material; electronic components; and sun shades and sail solutions.
3. KOMPAN Warranty Coverage:
  - a. The warranty applies to KOMPAN’s products for the time periods described for each product type above and with the limitations described in the warranty. The warranty period applies from the date of purchase by the first customer. The warranty covers only defects in materials. KOMPAN’s liability under the warranty is limited to repair or replacement of defective products, without charge, at KOMPAN’s discretion. Defective electronic components will be delivered and changed by a KOMPAN ICON Professional installer free of charge.
  - b. The warranty applies only if products have been properly installed according to the instructions provided by KOMPAN, and maintained correctly according to the KOMPAN Maintenance Manual. The warranty for ICON electrical components is dependent on those products being installed by an ICON trained and approved installer.
  - c. The warranty does not cover damage caused by accident, improper care, negligence, normal wear and tear, surface corrosion on metal parts, discolored surfaces and other cosmetic issues or failures due to misuse or vandalism. Natural changes in wood over time are considered cosmetic issues and are not covered.
  - d. KOMPAN provides non-KOMPAN branded products and installation services performed by certified third party suppliers. The general KOMPAN warranty does not apply to such non-KOMPAN branded products and installation services, which

may carry their own warranties. KOMPAN will pass on information about such warranties where possible.

- e. KOMPAN's Lifetime Warranty is in effect for the lifetime of the product until the product is uninstalled and / or taken out of use.
- f. KOMPAN's general terms and delivery conditions apply and supplement the warranty.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain playground and fitness equipment from the following approved manufacturer:
  - 1. KOMPAN Inc.  
Matt Burns, Principal Sales Representative  
Mobile: 310-775-5082  
Email: [MatBur@Kompan.com](mailto:MatBur@Kompan.com)  
[www.kompan.us](http://www.kompan.us)
- B. Playground and fitness equipment and components shall have the IPEMA Certification Seal.
- C. Obtain Basketball goal from the following approved manufacturer:
  - 1. JayPro Sports  
976 Hartford Turnpike  
Waterford, CT 06385  
(800) 243-0533

### 2.2 PLAYGROUND EQUIPMENT

- A. Climbing Structure (Item A): KOMPAN Wave, #COR880845
  - 1. Height: 9'-2"
  - 2. Steel Color: Yellow
  - 3. Rope Color: Black
  - 4. Membranes: Black
  - 5. Play Discs: Purple
- B. Swing Set (Item B): KOMPAN Two-Bay Portal Swing. #KSW950880
  - 1. Height: 8'
  - 2. Legs & Connector: Hot-Dipped Galvanized Steel, Color: Yellow
  - 3. Crossbeam: Hot-Dipped Galvanized Steel, Color: Yellow
  - 4. Swing Hang: Galvanized and equipped with anti-wrap suspension
  - 5. Swing Seat, Standard: KOMPAN Belt Seat Eight Feet Height
    - a. Color: Black

- b. Chains: Stainless Steel
    - c. Quantity: Two (2) Swings
  - 6. Swing Seat, ADA: KOMPAN Birds Nest swing
    - a. Color: Black
    - b. Chains: Stainless Steel
    - c. Quantity: One (1) Swing
- C. Embankment Slide (Item C): KOMPAN Open-Straight Stainless-Steel Embankment Slide, #COR711501-1230
  - 1. Slide: Stainless Steel
  - 2. Slide Width: 5' Wide
  - 3. Quantity: See Equipment Schedule
- D. Toddler Play Panel (Item D): KOMPAN Music Play Panel 2, #PCM713099
  - 1. Posts: Hot-dip galvanized steel.
    - a. Color: Anthracite Gray
  - 2. Panel 1: Xylophone Music Panel
    - a. Panel Color: Red
  - 3. Panel 2: Drums
    - a. Panel Color: Yellow
    - b. Accessory: Megaphone
    - c. Accessory Color: Yellow
  - 4. Quantity: See Equipment Schedule
- E. Spinner Platform (Item E): KOMPAN Spica 2, #GXY8015
  - 1. Posts: Hot-dip galvanized
  - 2. Color: Manufacturer standard
  - 3. Quantity: See Equipment Schedule
- F. Toddler Spinner Platform (Item F): KOMPAN Toddler Spica, #M19101-3517P
  - 1. Posts: Hot-dip galvanized
  - 2. Color: Manufacturer standard
  - 3. Quantity: See Equipment Schedule

### 2.3 FITNESS EQUIPMENT

- A. Dip Bench (Item G: KOMPAN Dip Bench, #FSW20200-Custom 20120782)
  - 1. Posts: Hot-dip galvanized steel.
    - a. Color: Yellow
  - 2. Quantity: See Equipment Schedule
- B. Pull-Up Bars (Item H): KOMPAN Square Pull-up Station Pro, #FSW21801-Custom 20210783
  - 1. Posts: Hot-dip galvanized steel.
    - a. Color: Yellow
  - 2. Quantity: See Equipment Schedule
- C. Fitness Stencil (Item I): KOMPAN Agility Dots, #SUR11200-001
  - 1. Paint Color: Yellow

2. The recommended paints for this application on EPDM rubber are UV and weather resistant two component polyurethane with good long-term elasticity and abrasion resistance. The material contains solvent and is a system especially suited for all synthetic sports and playing surfaces.
  3. See KOMPAN product manual for more information.
  4. Quantity: See Equipment Schedule
- D. Cross Training Step, 8-In. (Item J): KOMPAN Step, 8-In., #FAZ30100-Custom 20210784
1. Posts: Hot-dip galvanized steel.
    - a. Color: Yellow
  2. Quantity: See Equipment Schedule
- E. Cross Training Step, 16-In. (Item K): KOMPAN Step, 16-In., #FAZ30200-Custom 20210785
1. Posts: Hot-dip galvanized steel.
    - a. Color: Yellow
  2. Quantity: See Equipment Schedule
- F. Basketball Goal (Item L): JayPro Sports “Basketball System – The Playground,” #LS-200 (Philadelphia Parks and Recreation standard).Quantity: One (1) Unit
1. Clear Acrylic Backboard per PPR Standards.
  2. Quantity: See Equipment Schedule

## 2.4 CAST-IN-PLACE CONCRETE

- A. Concrete Materials and Properties: Dry-packaged concrete mix complying with ASTM C387/C387M and mixed at site with potable water, according to manufacturer's written instructions, for normal-weight concrete with minimum 28-day compressive strength, slump, and aggregate size per manufacturer's instructions.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for earthwork, subgrade elevations, surface and subgrade drainage, and other conditions affecting performance of the Work.
1. Do not begin installation before final grading required for placing playground and fitness equipment and protective surfacing is completed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Comply with KOMPAN's written installation instructions for each equipment type unless more stringent requirements are indicated. Anchor playground equipment securely, positioned at locations and elevations indicated.
  - 1. **Maximum Equipment Height:** Coordinate installed fall heights of equipment with finished elevations and critical-height values of protective surfacing. Set equipment so fall heights and elevation requirements for age group use and accessibility are within required limits. Verify that equipment elevations comply with requirements for each type and component of equipment.
- B. **Post and Footing Excavation:** Excavate holes for posts and footings as indicated in firm, undisturbed or compacted subgrade soil.
- C. **Post Set on Subgrade:** Level bearing surfaces with drainage fill to required elevation.
- D. **Post Set with Concrete Footing:** Comply with ACI 301, dry-packaged concrete-mix manufacturer's written instructions for measuring, batching, mixing, transporting, forming, and placing concrete.
  - 1. Set equipment posts in or on concrete footing per equipment KOMPAN's instructions. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at the correct angle, alignment, height, and spacing.
    - a. Place concrete around posts and vibrate or tamp for consolidation. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
  - 2. **Embedded Items:** Follow equipment KOMPAN's written instructions and drawings to ensure correct installation of anchorages for equipment.
  - 3. **Finishing Footings:** Smooth top, and shape to shed water.

### 3.3 FIELD QUALITY CONTROL

- A. **Testing Agency:** CSPI-certified KOMPAN representative, or another qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections:
  - 1. Perform inspection and testing for each type of installed playground and fitness equipment according to ASTM F1487.
- C. Playground and fitness equipment items will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

- E. Notify Landscape Architect forty-eight (48) hours in advance of date(s) and time(s) of testing and inspection.

END OF SECTION 116800



## SECTION 123661

### SIMULATED STONE COUNTERTOPS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Quartz agglomerate countertops and backsplashes.

##### 1.2 ACTION SUBMITTALS

###### A. Product Data: For countertop materials.

###### B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

###### C. Samples: For each type of material exposed to view.

#### PART 2 - PRODUCTS

##### 2.1 QUARTZ AGGLOMERATE COUNTERTOPS

###### A. Configuration: Provide countertops with the following front and backsplash style:

1. Front: Radius edge with apron, 1 1/2 inches high with 3/8-inch radius.
2. Backsplash: Radius edge with 3/8-inch radius.
3. Endsplash: Matching backsplash.

###### B. Countertops: 3/4-inch-thick, quartz agglomerate with front edge built up with same material.

###### C. Backsplashes: 3/4-inch-thick, quartz agglomerate.

##### 2.2 COUNTERTOP MATERIALS

###### A. Plywood (framing): Hardwood plywood complying with HPVA grading rules, A-1 grade; rotary cut.

###### B. Adhesives: Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- C. Quartz Agglomerate: Solid sheets consisting of quartz aggregates bound together with a matrix of filled plastic resin and complying with the "Physical Characteristics of Materials" Article of ANSI SS1.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Cambria.
    - b. Cosentino USA.
    - c. E. I. du Pont de Nemours and Company.
    - d. LG Chemical, Ltd.
    - e. Meganite Inc.
    - f. Samsung Chemical USA, Inc.
    - g. Technistone USA, Inc.
    - h. Transolid, Inc.
  2. Colors and Patterns: As selected by Architect from manufacturer's full range.
- D. Solid Wood Edges and Trim: Clear hard maple lumber, free of defects, selected for compatible grain and color, and kiln dried to 7 percent moisture content.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

END OF SECTION 123661

**SECTION 230000**  
**GENERAL MECHANICAL SYSTEM REQUIREMENTS**

1.0 INSIDE AMBIENT DESIGN PARAMETERS & LOAD CALCULATIONS:

- A. Indoor ambient temperatures shall be maintained at 72°F. HVAC systems (cooling and heating) shall be sized to maintain this indoor room temperature. Heating and Cooling loads shall be calculated and adjusted to account for load reductions that are achieved when energy recovery systems are utilized in the HVAC system.

1.1 HVAC SYSTEMS AND EQUIPMENT SELECTION PROCEDURES:

- A. All newly constructed spaces shall be heated, cooled and ventilated. All existing spaces that are upgraded shall be provided with heating, cooling and ventilation unless otherwise specified by the scope of work.
- B. Natural Gas: All equipment (boilers, RTU's Heat-Pumps, etc.) for facilities with existing natural gas service shall operate on natural gas only.

C. Heating:

- 1. Existing gas fired hydronic heating system to be demolished.
- 2. Heating to be provided by split system heat pumps

D. Cooling & Ventilation:

- 1. All new and upgraded spaces shall be air-conditioned unless otherwise specified in the scope of work. Equipment shall be sized based on cooling loads. Cooling loads shall include the sensible loads and the latent dehumidification loads. Ventilation calculations shall be calculated in accordance with parameters defined in UCC and ASHRAE Standards.
- 2. Unless not feasible, new and upgraded spaces shall be air-conditioned, heated and ventilated by Rooftop Units (RTUs) with Direct Expansion (DX). RTU's shall utilize Variable Refrigerant Flow (VRF) and provide a method of tempering the ventilation air to meet indoor temperature and ventilation requirements. All RTU's shall be entirely enclosed (sides and top) by a chain-link fence or similar vandal-proof enclosures.
- 3. Small single-zone spaces, or spaces in which RTUs installations are not feasible shall be equipped with split-unit systems. The outdoor condensing unit(s) shall have a full vandal-proof enclosure, and preferably be mounted on the roof.
- 4. For indoor units, no condensate pumps shall be used for any units. All condensate must be drained through gravity.

1.2 APPROVED MANUFACTURERS:

A. The “Approved Manufacturers” for all HVAC and Mechanical equipment are listed below. An “Approved Equal” may be selected with the approval of the OR. If the equipment is not listed below, the equipment selected must be approved by the EOR

B. Split A/C Units:

1. Daikin
2. Mitsubishi
3. American Cool Air

C. Exhaust Fans:

1. Loren Cook Co.
2. Greenheck Corp.

**SECTION 230593**  
**TESTING, ADJUSTING, AND BALANCING FOR HVAC**

1.1 GENERAL OUTLINE

A. Testing & Balancing Agency TAB:

1. The air distribution and hydronic systems shall be tested and balanced by an independent agency, licensed, bonded, and certified to perform such work in the city of Philadelphia.
2. The TAB Contractor shall be currently licensed and certified by Associated Air Balancing Council (AABC), or National Environmental Balancing Bureau (NEBB), or Testing, Adjusting and Balancing Bureau (TABB);
3. The work of the Testing & Balancing (TAB) Contractor shall be specified in the Construction Documents by the Design Professional.
4. The TAB Contractor shall be selected by the OWNER. Under no circumstances shall the TAB contractor be a sub-contractor to the General or Mechanical Contractor.

B. Design Consultant Specifications:

1. Specify that all air-distribution systems shall be tested and balanced. The air -flows shall be specified to be set within 5% of the design requirements.
2. Specify all necessary dampers, controls, and shaves required to meet the balance conditions.
3. Specify mechanical system noise levels that are to be compatible with the intended function within the building spaces.
4. Specify that final to be conducted after all systems are operational and have been accepted.
5. Specify that all systems start-up, testing, balancing, final operations, maintenance & training manuals, shall be completed on or before substantial completion.
6. Specify that all systems start-up, testing, balancing, final operations, maintenance & training manuals shall be completed as a requirement of substantial completion.

C. TAB Submittal Requirements:

1. TAB contractor shall provide verification that systems operate at 50% and 100% of the design capacity.
2. TAB report shall include copies of equipment cut-sheets, including major equipment, diffusers, dampers, pump and fan curves, etc.
3. TAB report for air-balancing shall include drawing plan indicating and identifying diffuser/grille locations.

**SECTION 230900**  
**CONTROL SYSTEMS EQUIPMENT**

1.1 GENERAL OUTLINE

- A. HVAC systems shall be zoned to differentiate between north, south, east, and west exposures, and internal areas.
- B. Split System heat pumps to be supplied with integral controls.

**SECTION 260100**  
**WIRING MATERIALS AND METHODS**

**PART 1 - GENERAL**

**1.1 RELATED SECTIONS**

- A. Section 260000 - General Electrical Requirements

**1.2 GENERAL REQUIREMENTS**

- A. All materials and equipment furnished by this Contractor shall be new, the best in grade and quality, and manufactured in the United States of America with standards and ratings as specified herein. No substitution or deviation from the materials and equipment specified herein will be allowed except by written permission from the Engineer.
- B. All materials and equipment shall be of the latest type and design and, where applicable, shall bear the label, stamp or seal of UL, NFPA, IEEE, NEMA, ASME, ASTM, ASA and other industry regulatory groups.
- C. All items of the same kind shall be of the same make throughout the work.

**PART 2 - PRODUCTS**

**2.1 CONDUCTORS**

- A. Manufacturer: Triangle, General Cable, General Electric, Anaconda or Phelps Dodge.
  - 1. Standards: NEC Article No. 310.
  - 2. Conductor: Copper, solid for No. 8 and smaller, stranded for No. 6 or larger.
  - 3. Insulation: 600 volts; THWN/THHN for general use, THHN or TFN for lighting fixture use
  - 4. Minimum size: No. 14 for control wiring, No. 12 for all other unless otherwise noted.
  - 5. Other Types: As indicated or required.

**2.2 RACEWAYS**

- A. Rigid Conduit: Conform to the following:
  - 1. Manufacturer: Triangle, Spang, Youngstown, or Jones & Laughlin.
  - 2. Standards: NEC Article No. 346; UL.
  - 3. Material: Steel, heavy wall, hot dip galvanized inside and outside.
  - 4. Joints: Standard pipe thread: furnished with coupling; shipped with thread protector through 2" size.
  - 5. Minimum Size: 3/4".
- B. Intermediate Metal Conduit (IMC): Conform to the following:

1. Manufacturer: Triangle, Spang, Youngstown.
2. Standards: NEC Article No. 345; UL.
3. Material: Steel only, intermediate wall thickness, hot dipped galvanized.
4. Joints: Standard pipe thread, furnish with coupling, shipped with thread protector through 2" size.
5. Minimum Size: 3/4".

C. Electrical Metallic Tubing (EMT): Conform to the following:

1. Manufacturer: Triangle, Spang, Youngstown, Kaiser or Jones & Laughlin.
2. Standards: NEC Article No. 348; UL 797.
3. Material: Contractor's option: Steel, thin wall, electro-galvanized or aluminum, thin wall.
4. Minimum Size: 3/4".

D. Flexible Conduit: Conform to the following:

1. Manufacturer: Triangle, Spang, Youngstown or Jones & Laughlin.
2. Standards: NEC Article No. 350; UL1.
3. Material: Steel, hot dip galvanized.
4. Minimum Size: 1/2", and 3/8" where permitted by NEC.

E. Polyvinyl/Chloride Raceways (PVC)

1. Manufacturer: Johns-Manville, Can-Tex, Quazite.
2. Standards: NEC Article 347; UL. 651
3. Material: Heavy wall, Schedule 40 made of virgin polyvinyl chloride or material re-ground from the manufacturer's own products.
4. Fittings: Virgin PVC, Schedule 40
5. Joints: Solvent welded; watertight and pressure tight to 25 PSI.
6. Adapters: PVC to metallic conduit adapters designed for the purpose.
7. Minimum Size: 2" Diameter.

2.3 CAST CONDUIT FITTINGS

A. Manufacturer: Crouse-Hinds, Appleton, Pyle-National or Killark.

1. Standards: NEC Article No. 370.
2. Description: Cast body with gasketed screw cover and threaded hubs.
3. Material: Cast ferrous alloy, corrosion resistant finish for steel conduit: zinc alloy and similar soft metal castings not acceptable; Copper-free aluminum casting for aluminum conduit; formed PVC for plastic conduit.

2.4 CONDUIT CONNECTORS

A. Manufacturer: T & B, Appleton or OZ.

1. Standards: NEC Article No. 370.



2. Metal Conduit Materials: Cast malleable iron and pressed steel; rain tight and concrete tight; threaded for rigid steel conduit, intermediate metal conduit, and compression type or indentor type for EMT; corrosion resistant finish.
3. Not acceptable: Setscrew connectors and tamp-on types; zinc alloy and similar soft metal pressure castings.
4. Connectors for EMT Conduit 3" and larger shall be set screw or uncouple type.

## 2.5 EXPANSION FITTINGS

- A. Manufacturer: Crouse-Hinds, Appleton or OZ.
  1. Manufacturer's Designation: XJ and XJSA.
  2. Material and Finish: Same as rigid conduit.
  3. Description: Cast slip-joint fitting for conduit, with flexible bonding conductor for continuity of ground through metallic conduit.

## 2.6 SLEEVES

- A. Material: Schedule 40 galvanized steel pipe.
  1. Application: Floors, through exterior masonry walls, through roof, and underground.
- B. Material: 18 gauge galvanized sheet metal.
  1. Application: Areas not requiring schedule 40 pipe.

## 2.7 WIREWAYS

- A. Manufacturer: Square-duct, Keystone or Hoffman.
  1. Standards: NEC Article No. 362.
  2. Material: Steel, baked enamel finish, with hinged cover; conduit knock- outs.
  3. Size: Minimum 4" square; other sized as noted on drawings.
  4. Accessories: Hinged connectors: elbows; fittings for changes in direction; cut-off fittings; hangers; closing plates; cabinet adapters; wire retainers; other modifications and accessories as required for project.

## 2.8 OUTLET BOXES

- A. Manufacturer: Steel City, Race and Appleton.
  1. Standards: NEC Article No. 370.
  2. Material: Pressed steel, zinc coated.
  3. Minimum size: 4" square or octagon; gangable 2" x 3" where used with cable; depth as required for project.
  4. Extension rings: To suit various conditions.
  5. Hardware: Grounding screw and cable wiring connectors as required by wiring method.
  6. Other Types: As required by job conditions.

## 2.9 PULL AND JUNCTION BOXES - INTERIOR

### A. Manufacturer: Hoffman, Keystone or Burns.

1. Standards: NEC Article No. 370; ASTM A-386.
2. Material: Galvanized steel, code gauge.
3. Cover: Same material as box, screw on type, maximum size 300 square inches in one piece.

## 2.10 PULL AND JUNCTION FOR UNDERGROUND WORK

### A. Manufacturer: Quazite or equal

1. Standards: N.E.C.; UL; ASTM D-635
2. Material: Composolite non-concrete type enclosure; Reinforced Plastic Mortar designed and tested to temperatures of -50 degrees F.
3. Color: Grey for paved areas; Green for grassy areas.
4. Loading: "Light vehicular traffic" (5000# load over any 10" x 10" area).
5. Assembly: Cover, box and extension with solid base; cover shall be interchangeable with other manufacturers.
6. Fasteners: Pent-head, recessed type.
7. Hubs: Suitable for solvent welding of PVC raceways to box.

## 2.11 CONVENIENCE RECEPTACLES - INTERIOR

### A. Manufacturer: P & S No. 26342, Arrow Hart, or Leviton

1. Standards: NEC Article 410L, and NEMA.
2. Type: Duplex, 2 pole, 3 wire, with U slot ground.
3. Construction: Heavy duty, totally enclosed back, specification grade.
4. Contacts: 20 amp., phosphor bronze, double wiping.
5. Wiring terminal type: Side or back
6. Body: Brown phenolic composition.
7. Plates: .035" Type No. 302 (18-8) stainless steel with satin finish. (Tamperproof hardware)

## 2.12 CONVENIENCE RECEPTACLES - EXTERIOR

### A. Manufacturer: P & S, Arrow Hart, or Leviton

1. Standards: NEC Article 410L, and NEMA
2. Type: Duplex, 2 pole, 3 wire, with U-slot ground; Ground fault circuit interrupting protection.
3. Construction: Heavy duty, totally enclosed back, specification grade.
4. Contacts: 20 amp, phosphor bronze, double wiping.
5. Wiring terminal type: Side.
6. Body: Brown phenolic composition.
7. Cover plate: Gasketed, cast metal with cap over each receptacle opening; Caps permanently attached to cover plate by short length of bead chain or spring hinged flap. (Tamperproof hardware).

## 2.13 LOCAL SWITCHES - INTERIOR

A. Manufacturer: P & S No. 26021, 26023, 26024, Arrow Hart, or Leviton.

1. Standards: NEC Article No. 380; NEMA.
2. Construction: Specification grade, 20A at 120/277 V., 2 HP at 240 V., 1 HP at 120 V.
3. Type: Flush, quiet, AC, totally enclosed brush tumbler, rocker type handle single pole, 3-way and 4-way as noted on drawings.
4. Modifications: Pilot light, key operation, interchangeable type as indicated.
5. Wiring Type: Side or back; Accept #10 wire, if required.
6. Body: Unit, brown phenolic composition.
7. Plates: .035" Type No. 302 (18-8) stainless steel with satin finish. (Tamperproof hardware)

#### 2.14 SMALL WIRE CONNECTORS

A. Manufacturer: 3-M, T & B or Ideal.

1. Standards: NEC Article No. 110.
2. Application: Conductors No. 10 and smaller, solid and stranded, copper conductors.
3. Description: Twist-on solderless pressure connector, spiral metal spring in metal cup or crimped metal sleeve, plastic insulating cap with long flared skirt to cover un-insulated portion of conductor.

#### 2.15 LARGER COPPER CONDUCTOR CONNECTORS

A. Manufacturer: T & B Series 54,000, Burndy or OZ.

1. Standards: NEC Article No. 110.
2. Application: Copper conductors No. 8 and larger, solid and stranded, wire and bus.
3. Material: Copper alloy, tin plated aluminum alloy, or other approved material.
4. Wire Connector: Long barrel compression type attached with hydraulic die.
5. Bus Connector: Compression type with multiple bolts, tin plated flat washer.
6. Applied insulation: Vinyl tape over insulating filler, heat shrinkable sleeves, or pre-molded plastic enclosure to fit each specific combination of connector and conductors.

#### 2.16 FIRE RESISTANT SEALANT

A. Manufacturer: CTC PR: 855

1. Standards: UL Classified; ASTM E119-73; ASTM E-8475.
2. Description: Silicone foam to prevent spread of fire and products of combustion through fire-rated, fire-resistant, and fire-stopped barriers by sealing interstitial spaces of penetrations.
3. Characteristics: Expand 2 to 3 times liquid volume; non-toxic and non-allergenic before and after cure; cure time 24 hours; flame spread number 20; fuel contributed factor 20; optical smoke density factor 235.

#### 2.17 GROUNDING MATERIALS

A. Manufacturer: Chance, Hubbard, Steel City, Burndy, OZ, T & B, Cadweld or Blackburn.

1. Standards: NEC Article No. 250.
2. Materials: Non-ferrous copper and its alloys; aluminum not acceptable.

3. Grounding Conductors: Code gauge stranded copper wire, bare and with green insulation.
4. Ground bus, field installed: Copper minimum size 1/4" x 2".
5. Ground clamps and connectors: Multiple bolt type. Clamps for pipe, lugs for flat surfaces, saddle clamp or compression type for wire.
6. Conduit ground bushings: Galvanized malleable iron with screw pressure connector; insulated throat where required.

## 2.18 SPLICES AND TAPS

- A. All splicing shall be done in outlet, panel and junction boxes, and not in conduits or equipment cabinets. Splices or taps in conductors shall be made with connectors and wrapped with rubber tape of a type and thickness equivalent to the original insulation and then covered with friction tape. When connecting stranded cables together, each strand shall be carefully cleaned before soldering or connecting. All taps and splices in branch circuit wiring shall be made with pressure type connectors.
- B. Underground splices shall be avoided. Where necessary, use material and methods approved for submersed conditions.

## 2.19 PHOTOCONTROLS

- A. Photocontrols for lighting shall provide a single-pole contact closure at a decreasing illumination level of one foot-candle. The contact shall open at an increasing illumination level adjustable between one and three foot-candles. On and off delays of a least 15 seconds shall prevent spurious operation due to transient lighting phenomena. The photocontrol shall be locking type with hermetically sealed element, and shall be rated a 1.8 KVA at 240 volts AC. The control shall be supplied complete with all-weather locking type receptacle with color-coded leads, and integral two-inch slipfitter, if required.

## 2.20 CONTACTORS AND REMOTE CONTROL SWITCHES

- A. Contactors as manufactured by ASCO (ASCO 920 and 917), Square-D Company or ITE – Siemens, and Remote Control Switches shall be enclosed type: (NEMA 1 Enclosure), mechanically held with 120 or 240 volt coils, encapsulated. Number and rating of poles shall be as shown. Contacts shall be silver alloy, double break. Auxiliary relay shall be provided for 2-wire control, where indicated. No other manufacturers of contactors than those listed herein shall be accepted.
- B. Control switches for contactors and remote control switches shall be two position (ON-OFF), momentary or maintained contact, Push button type, with pilot light, as required, specification grade, rated 20 amperes, 250 volts. Each switch or group of switches shall be provided with a laminated plastic nameplate indicating the sport and/or field controlled (See Identification, Nameplates and Tags).

## 2.21 TIME SWITCHES

- A. Time switches shall be multi-pole or single pole, designed for operation on alternating current, rating as indicated on the drawings. Switches shall be equipped with astronomic 24-hour, 7-day dial, necessary tripping and omitting devices. Time switches shall provide reserve power for 16 hours operation. Unit shall be contained in NEMA-1 enclosure.

## 2.22 HARDWARE

- A. All exposed fasteners shall be stainless steel, vandal proof type requiring special tools. Provide the number of special tools as required by the Department, upon completion of the project.

## 2.23 LOCKS AND KEYS

- A. All locks for lighting and power panels, and all other electrical systems of locked apparatus shall have keys which are compatible with the existing system. The Department shall be consulted prior to ordering locks for equipment.

## 2.24 IDENTIFICATION, NAMEPLATES AND TAGS

- A. Provide for each safety switch, panelboard and similar items of equipment, a laminated plastic nameplate of molded phenolic compound to indicate the device and equipment served. Characters shall be white, not less than 1/4 inch high.
- B. Provide approved tags for all feeders, at both ends, and at intermediate junction and pull boxes. Tag shall indicate feeder designation or equipment served, and state phase and voltage of feeder.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. The equipment and materials shall be installed in accordance with the recommendations of the respective manufacturers.
- B. If more than one trade is involved in the project, this Contractor shall cooperate and coordinate his work with the other trades. The locations of pipes, ducts, conduits, panelboards, lighting outlets, air outlets, motor controls and other equipment must be coordinated in order to avoid any interferences or placing services at the wrong locations. Exact locations of outlets, conduits and other materials and equipment must be coordinated with and approved by the Department.
- C. The work shall be performed in an approved first class, workmanlike manner, and shall conform to the best practices of the trade, and to all requirements of the National Electrical Code.
- D. The Electrical Contractor shall at all times protect and preserve all materials, equipment, fixtures and conduits from corrosion, dirt, paint, building materials, acid, tools, overload, freezing, theft and vandalism. This Contractor shall repair or replace all equipment and materials which are lost or damaged as the result of inadequate protection. Open ends of conduit and equipment shall be capped or plugged during the construction schedule and remain capped or plugged until wiring is ready to be installed.
- E. All materials and equipment shall be properly isolated against the transmission of vibration or noise to any part of the building.

- F. Where work is designated to be directed or performed by the General Contractor, and no General Contractor is involved in the project, the Electrical Contractor shall employ the proper trades to accomplish the work.

### 3.2 WIRING METHODS

- A. Rigid steel conduit shall be used for all exposed exterior raceways. Rigid steel conduit shall also be used for raceways in or below slabs on grade, for underground raceways in locations regularly subject to vehicular traffic, and where shown. Exposed exterior raceways shall be installed only when specifically indicated on the plans or when specifically directed by the Department. Normally, exterior raceways shall be installed underground.
- B. Intermediate metallic conduit shall be used for raceways in solid masonry walls and partitions, and for exposed interior raceways in locations where raceways may be subject to abuse or injury.
- C. Electrical Metallic Tubing (EMT) may be used for all exposed interior branch circuit wiring in locations not subject to abuse or injury and for concealed wiring where conditions of heat or mechanical abuse preclude the use of PVC raceways.
- D. Rigid steel conduit installed underground shall be provided with a 3-inch concrete envelope. Spacers shall be provided at the bottom of the trench at intervals not exceeding 4 feet, to assure that the envelope completely surrounds the conduit.
- E. Rigid PVC conduit shall be used for all underground raceways in areas not regularly subject to vehicular traffic, for raceways in concrete walls, floors and ceilings, and for raceways to be run through cinder fill. Provide a separate, code-sized ground wire in each PVC conduit.
- F. In underground raceways, rigid PVC conduit shall be snaked slightly to provide for soft spots in the trench.
- G. All underground raceways shall be installed at least 30 inches below finished grade. In each trench containing underground raceways, provide a plastic warning tape, equal to Thomas & Betts, one foot below grade.
- H. All underground raceways shall be laid staggered so that no joints are horizontally opposite one another. Where conduits enter hand-holes and/or manholes, they shall be provided with suitable bushings of the same size. The Electrical Contractor shall be responsible for checking grades and installing conduits with suitable drainage to manholes. Where conduits enter buildings, rigid galvanized conduit shall be used.
- I. Exposed raceways shall be installed parallel or perpendicular to walls, structural members or intersections of vertical planes and ceilings.
- J. All changes in direction of one-inch conduits and larger shall be made with standard elbows or cast metal fittings. Field-made bends and offsets in 3/4-inch conduit shall be made with an approved hickey or conduit -bending, machine. Crushed or deformed raceways shall not be installed. Trapped raceways in damp and wet locations shall be avoided. Care shall be taken to prevent the lodgment of plaster, dirt or trash in raceways, boxes, fittings and equipment during the course of construction. Clogged raceways shall be entirely freed of obstruction or shall be replaced.

- K. Conduits or pipes embedded in concrete slabs shall be spaced not closer than three diameters on centers and they shall be so placed as to avoid changing the locations of the reinforcement.
- L. Except when plans of conduits and pipes are approved by the Engineer, embedded conduits, other than those merely passing through, shall be not larger in outside diameter than one-third the thickness of the slab, wall or beam in which they are embedded.
- M. Raceways shall be securely supported and fastened in place at intervals of not more than 10 feet with pipe straps, wall brackets, hangers or ceiling trapeze. Fastenings shall be by wood screws or screw-type nails to wood; by toggle bolts on hollow masonry units; by expansion bolts on concrete or brick; by machine screws, welded threaded studs or studs driven in by a powder charge and provided with lock washers and nuts may be used in lieu of expansion bolts or machine or wood screws. Threaded C-clamps shall not be used. Raceways or pipe straps shall not be welded to steel structure. Wooden plugs shall not be used.
- N. No. 12 conductors and 3/4 in. raceways shall be the minimum used for power and lighting and No. 14 conductors and 3/4 in. raceways for control and signal systems. No conduit smaller than 3/4 in. shall be used.
- O. Raceways shall be exposed in unfinished rooms unless otherwise indicated on drawings. Exposed conduit shall follow building lines.
- P. Flexible metallic tubing shall be employed only where building construction does not allow use of rigid conduit, and in 18-inch lengths, for connection to lighting fixtures and to motors and other vibrating equipment.
- Q. Running threads shall not be permitted and approved threaded couplings shall be used on full weight conduit. Conduit bends shall be the long radius type without kinks, flattening or crushing. Each end of any conduit terminating in a pressed steel box of any kind shall be provided with an approved insulating type bushing.
- R. Conduit ends shall be square cut and reamed. Concealed conduits shall be run as straight and direct as possible. No more than four (4) 90 degree bends will be permitted in any run of conduit. Pull boxes shall be installed every 200 ft. which shall be reduced by 50 ft. for each 90-degree bend, unless otherwise indicated on drawings. In continuous runs of rigid PVC conduit of more than 90 ft., expansion joints shall be installed every 60 ft., and as required to compensate for linear thermal expansion and contraction of the conduit.
- S. No wires shall be installed in conduits, until all conduit work is completed and closed in such a manner as to prevent the possibility of water getting into the conduits.
- T. A separation of not less than 6 in. shall be maintained between all conduits and hot water or steam lines in the building, whenever possible. When it is not possible to provide the 6 in. separation an insulating pipe covering shall be installed on the electrical conduits.
- U. Provide a minimum of two spare two (2) inch conduit stub outs from each panelboard installed on the project for future use. Conduits shall be extended at least 24 inches beyond adjacent paved areas or foundations and capped. Mark exact locations on as-built drawings.
- V. No raceway smaller than 2-inch diameter shall be installed underground for field lighting circuits.

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### 3.3 GROUNDING

- A. Provide grounding in accordance with requirements of NEC Article No. 250.
- B. Provide a reliable low impedance metallic ground path for short circuit currents, so that circuit protective devices can operate quickly and effectively. Route the ground path parallel to the circuit conductors and physically as close to them as possible, generally using the metallic conduit system as a conductor. Make the ground path continuous to each outlet and electrically operated device in the Project.
- C. Ground frames of motors. Conduit system will be acceptable if connection box is bolted to motor frame. In other instances, provide grounding bushing on conduit and extend grounding conductor to a bolt on frame of motor. Where motor is part of apparatus, ground enclosure using connector furnished by manufacturer. Provide connector if none is furnished.
- D. At convenience receptacles, extend ground wire from grounding screw of receptacle to grounding connector of box.
- E. A code sized ground wire shall be provided in each feeder or branch circuit raceway installed on the project.
- F. Connect branch circuit ground conductor to each luminaire housing.
- G. Maximum resistance from a ground rod to ground shall not exceed three (3) ohms at any location.

### 3.4 CHASES, RECESSES AND OPENINGS

- A. This Contractor shall provide all openings, chases or recesses in the construction as may be necessary for his work and as approved by the Engineer.
- B. Where openings in masonry are required, they shall be made by coring only.

### 3.5 SLEEVES

- A. Sleeves shall be installed in all new construction. Sleeves shall be 22-gauge galvanized steel. The pipe sleeves shall be sized for passing conduit and extend approximately 2" above concrete pads.
- B. Sleeves shall be the proper design for waterproofing and flashing around the sleeves where required. The space between the piping and sleeve shall be caulked with an approved waterproof, high melting point sealing or asphalt compound.
- C. This Contractor shall furnish the sleeves and set them in the new construction as required for the installation of his work.

### 3.6 FLASHING AND COUNTERFLASHING

- A. This Contractor shall furnish and install the base flashing and the counter flashing materials for all work. This Contractor shall retain the services of an approved Roofing Contractor to perform this work.



### 3.7 FASTENINGS, SUPPORTS AND HANGERS

- A. Support all material from the building structural members in an approved manner.
- B. Where electrical equipment is mounted in suspended ceiling panels, provide support members to span between framing members of ceiling suspension system. Do not support electrical equipment from acoustical panels or other ceiling material; attach to this material for alignment only. Securely fasten support members to framing members.
- C. Electrical outlet boxes, cables and conduit shall not be supported from suspension wires of the ceiling suspension system. Do not attach equipment directly to tee bars, where boxes could interfere with lifting ceiling panels.
- D. Where electrical lighting fixtures and other equipment is installed on tee bars of suspended ceilings, use appropriate twist clips or scissors clips with threaded studs attached directly to tee bars.
- E. Provide mounting structures for electrical equipment where required. Use continuous slot channel or fabricate structure from galvanized structural steel angles and channels. Bolt or weld fabricated assemblies rigidly together, coat with suitable rust inhibiting primer and two finish coats of color as directed by Architect.
- F. Provide 1/4" spacers behind cabinets of electrical equipment to permit circulation of air.
- G. Provide racks of Continuous Slot Channel for parallel runs of conduit, and suspend on adjustable hangers. Use adjustable clevis hangers for individual runs of suspended conduit. Align suspended runs in horizontal plane for neat appearance. Perforated strap iron will not be permitted. Use approved beam clamps for connection to structural steel. Where structural steel has fireproof coating, cut coating as required to mount clamp and restore fireproofing to its original condition.
- H. Do not support from steel roof decks, joist bridging, ductwork, piping, or floor slabs less than 4" thick.
- I. Determine proper locations of anchors, inserts and supports, and maintain them in their proper locations during the period of construction.
- J. Use supporting hardware suitable for the purpose intended. Use expansion shields with machine screws to fasten to solid masonry. Use toggle bolts to fasten to hollow masonry. Use lag bolts to fasten to wood surfaces. Use approved methods for other conditions as required. No wood, plastic or fiber plugs will be permitted. Use approved beam clamps.
- K. Do not exceed manufacturer's load rating for mounting devices.
- L. In cast concrete, use box inserts which allow lateral adjustment of the threaded member for proper alignment. Use continuous box inserts where required.

### 3.8 EXCAVATION AND BACKFILLING

- A. This Contractor shall be responsible for the excavation, backfilling, shoring and care for all ground water for the complete installation of his work.

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- B. This Contractor shall also provide suitable indemnity for all accidents to humans, animals or equipment caused by his excavation work. He shall provide suitable guards or barricades, red lanterns, flares and other precautions for an approved and safe installation.
- C. Conduit shall be laid on undisturbed earth and not in fill. Cinder fill and stones or bricks beneath the conduit are prohibited. If the earth is not firm, the conduit shall be laid on concrete supports.
- D. Backfill shall be well tamped in layers of not more than 6 inches. It shall consist of clean earth, as much as possible, but in no case shall it contain stones large enough to injure the installation.
- E. After backfilling, this Contractor shall remove all excess materials from the premises and, if the surface was paved or sodded, repave and replace sod with material equal to, and level with, the adjacent surface.
- F. Care should be taken to protect all existing trees, bushes and planting during the installation of all underground work.

### 3.9 EXPANSION FITTINGS

- A. Provide expansion fittings where raceways cross building expansion and control joints. Maintain continuity of raceway grounding system by attaching bonding jumper as recommended by manufacturer.
- B. Use manufactured expansion fittings for all conduit installed under the following conditions:
  - 1. 1" and larger when exposed or above a suspended ceiling.
  - 2. Grouped on racks where any of the group is 1" or larger.
- C. Flexible conduit may be used for runs smaller than 1" where exposed, or concealed above suspended ceilings. Leave sufficient slack conduit for movement, and fasten on each side of joint.

### 3.10 OUTLET BOXES

- A. Provide outlet box for each outlet shown in the wiring system. Use 4" minimum size with conduit, of appropriate size and configuration. Provide interior partitions where required. Use octagon box for each individual lighting fixture and each continuous row of lighting fixtures in the ceiling. Provide fixture stud for box that supports lighting fixture. Provide other boxes as required.
- B. Install boxes square with building lines, fasten securely in place, and grout or patch plaster if masonry or wallboard does not fit snugly on all sides.
- C. Provide extension rings and raised cover plates in plaster, masonry and tile walls. Plug unused openings.
- D. Use sectional boxes with appropriate cable clamps for cable wiring. Provide green grounding screw for connection to ground wires.

- E. Do not install boxes back-to-back in partitions. Separate boxes in adjacent rooms at least 12" to prevent transmission of sound.

### 3.11 PULL AND JUNCTION BOXES - INTERIOR

- A. Provide pull boxes and junction boxes where required to facilitate installation of wiring, whether or not shown on drawings. Size boxes according to code, and provide interior partitions, insulated supports, hot dip galvanized angle iron braces, screw-on one-piece or split covers, ground connectors, and other accessories as required.
- B. Mount boxes in accessible but unobtrusive locations, such as closets and mechanical spaces. Provide access panels for boxes otherwise concealed in building construction.

### 3.12 PULL AND JUNCTION BOXES FOR UNDERGROUND WORK

- A. Install pull and junction boxes as detailed on the drawings.

### 3.13 WIRING DEVICES

- A. Mount receptacles vertically unless otherwise noted.

### 3.14 MOTOR STARTERS (IF REQUIRED AND/OR SHOWN)

- A. For installation of Manual and Magnetic Motor Starters, refer to DISTRIBUTION EQUIPMENT.
- B. Install manual motor starter switch in accordance with manufacturers recommendations. Do not gang switches or combine with other wiring devices unless starter switches have been properly derated.

### 3.15 SUPPORTS AT DRYWALL CONSTRUCTION

- A. Provide support members to carry weight of equipment; do not use drywall material to carry any weight. Attach to drywall material for alignment purposes only. Pierce drywall material as required to mount equipment on support members.
- B. Equipment normally supported from outlet box will require no additional support. Attach outlet boxes directly to studs of partitions. Provide support member to span between studs, if required, for location of box.
- C. Where equipment on partitions cannot be supported by attachment to outlet box alone, coordinate supports with general construction. Limit weights as indicated below:
  1. Recessed equipment, single stud: 100 pounds maximum.
  2. Recessed equipment, double stud: 500 pounds maximum.
  3. Recessed equipment, greater than 500 pounds: Provide independent mounting structure inside partition.
  4. Surface mounted equipment, double stud (do not use single stud to carry weight): 100-pound maximum.

5. Surface mounted equipment, greater than 100 pounds: Provide independent mounting structure outside partition.

### 3.16 WIRE INSTALLATION

- A. Exercise care in storage and installation of wire and cable to avoid damage to conductors and their covering. Use an approved pulling compound as lubricant for pulling wires into raceway.
- B. Numbering of circuits on drawings are intended panelboard connections. Make panel connections so that circuit protectors are in logical operating sequence, and so that loads are reasonably balanced across all phases.
- C. Support conductors in vertical raceways in accordance with NEC requirements. provide manufactured clamps or compression fittings in bottom of panelboards if space permits, or provide separate pull boxes for such fittings where indicated.

### 3.17 SPLICES AND TAPS

- A. Make splices electrically and mechanically secure. Install small wire connectors so that no bare conductor is exposed. Tighten bolts on large conductor connectors so that conductor is deformed, but do not break strands of wire. Use compression tool with proper die for compression connectors in accordance with manufacturer's recommendations, so that conductors are deformed but not broken. Apply insulation over splice so that insulation thickness is at least 1-1/2 times that on conductor. Lap applied insulation at least 1" over conductor insulation so that no bare conductor is exposed.
- B. Terminate conductors on terminal strips in equipment where terminal strips are used. Provide appropriate connections, or hook conductors around terminal screws as required.
- C. Connect each wiring device to its neutral conductor by means of short jumper, so that removal of the device will not interrupt continuity of the neutral conductor feeding through the box.
- D. Provide encapsulated splice kits for all splices in areas subject to moisture, including wet locations inside buildings and underground hand holes, manholes and buried junction boxes. Install splice kit in accordance with manufacturers recommendations, and make splice waterproof. Apply sealing putty to surround each cable. Install mold body so that resin covers each cable sheath by a minimum of one inch.

### 3.18 BRANCH CIRCUITS

- A. Provide one neutral conductor for each single phase, 3 wire home run to a panelboard (or three phase, 4 wire home run, if applicable).
- B. Avoid excessive voltage drop by using No. 10 wire for 120-volt circuits that exceed 75 feet to outlet at center of load. Use minimum No. 10 wire for emergency lighting circuits regardless of voltage.
- C. Where home run indicates wire size larger than normal, continue this wire size throughout the circuit unless otherwise noted.

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- D. Lighting circuitry shown on the plans are diagrammatic and the Contractor shall be responsible for providing the required number of conductors in all circuits to accomplish proper switching and control of lighting.

### 3.19 OVERSIZED WIRING

- A. Where oversized wiring has been indicated to overcome voltage drop and does not fit properly into the equipment served, provide a suitable junction box adjacent to the equipment for the change of wire size.
- B. Provide reduced wire size from junction box to equipment. Keep the reduced wire size as large as possible, but in no case use wire of ampacity less than that required by NEC to feed the equipment.
- C. Where home run indicates wire size larger than normal, continue this wire size throughout the circuit unless otherwise noted.

### 3.20 IDENTIFICATION, NAMEPLATES AND TAGS

- A. Identify and mark all electrical equipment to meet OSHA requirements, and as specified herein.
- B. In every pull box, terminal box, and all places where wires may not be readily identified by name plate markings on the equipment to which they connect, identify each circuit with a tag or plastic label.
- C. Mark all terminal boxes, safety switches, controllers, manual motor starters, push button switches and other control equipment with rigid laminated plastic legend plates having 3/16" lettering to clearly indicate the services or equipment for which they are provided.
- D. Mark all equipment furnished under Division 16 and where it is related to equipment furnished under other Divisions. Use nomenclature that corresponds to the markings on that equipment.
- E. Identify all panelboards with designation indicated on the drawings, and distribution voltage. Use rigid laminated plastic legend plates installed on the inside of the doors of flush mounted panels and outside of the doors of surface mounted panels with 1/4" lettering.
- F. Indicate circuit number corresponding to panelboard circuit directory.

### 3.21 FIRE RESISTANT SEALANT

- A. Apply sealant in compliance with manufacturer's recommendations. Clean surfaces before application, using primer where necessary. Install damming material to prevent undesirable flow, and remove after foaming action has stopped. Separate cables before injecting sealant to prevent voids. Provide sufficient thickness to equal fire rating of the barrier being penetrated

### 3.22 CONCRETE

- A. Concrete for the encasement of underground raceways shall be provided by the Electrical Contractor. Spacers shall be provided to assure clearance between layers of raceways and between the lowest raceways and the bottom of the trench, to assure complete encapsulation.

B. Concrete shall have a minimum compressive strength of 3500 PSI after 28 days.

**SECTION 260500**  
**BASIC ELECTRICAL MATERIALS AND METHODS**

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. Section 16000 - General Electrical Provisions
- B. Section 16100 - Wiring Materials and Methods.

1.2 GENERAL REQUIREMENTS

- A. All materials and equipment furnished by this Contractor shall be new, the best in grade and quality, and manufactured in the United States of America with standards and ratings as specified herein. No substitution or deviation from the materials and equipment specified herein will be allowed except by written permission from the Engineer.
- B. All materials and equipment shall be of the latest type and design and, where applicable, shall bear the label, stamp or seal of UL, NFPA, IEEE, NEMA, ASME, ASTM, ASA and other industry regulatory groups.
- C. All items of the same kind shall be of the same make throughout the work.

PART 2 - PRODUCTS

2.1 PANELBOARDS

- A. Manufacturer: Square D, Siemens ITE or GE
  - 1. Manufacturer's designation: NQOB, NEHB, QMB
  - 2. Standards: NEC Article 384; UL; NEMA.
  - 3. Description: Dead front automatic circuit breaker type with enclosing cabinet.
  - 4. Circuit Breakers: Molded case bolted to bus bars.
  - 5. Electrical Characteristics: See drawings.
  - 6. Bus Bars: Copper; full distributed sequence phasing: connection straps for spaces; neutral bus unless otherwise indicated; ground bus.
  - 7. Line termination: Single or double compression type lugs, main breaker, or other type as shown on drawings; suitable for copper conductors.
  - 8. Cabinet: Steel, mount as noted in schedule; sufficient size to accommodate panelboard and adequate gutter space for wiring.
  - 9. Accessories & Modifications: Contactors, split busses and others as noted in schedule and as required by Project.
  - 10. All panelboard connections to main bussing for copper cables shall be with compression connectors.

2.2 MOLDED CASE CIRCUIT BREAKERS

A. Manufacturer: Square D, Siemens ITE or GE; same manufacturer as panelboards.

1. Standards: NEC Article 240; UL; NEMA.
2. Applications: Panelboards; individually mounted circuit protectors; switchboards.
3. Construction: Plastic housing; internal arc chutes; internal barriers between poles; internal linkage for simultaneous operation of all poles; on-off-trip indication by handle position.
4. Overload protection: inverse time mechanism using bimetallic tripping element.

Circuit Breakers rated 200 amps and above shall be continuous rated.

5. Short circuit protection: Magnetic tripping element; adjustable instantaneous and interchangeable trip for frame sizes above 100 amperes in all main switchboards, or as noted on drawings.
6. Operation: Quick-make, quick-break; trip free from handle on automatic operation.
7. Rating: Voltage as required by system; overcurrent rating as noted in schedule; interrupting rating based on NEMA test procedures, 10,000 amp minimum RMS symmetrical or as indicated.
8. Accessories: As noted on drawings, including shunt trip; handle guards; handle breakers.
9. Not acceptable: External tie handles for multi-pole breakers; "Compact" breakers.

## 2.3 CABINETS

A. Manufacturer: Square D, Siemens ITE or GE, same manufacturer as panelboards.

1. Standards: NEC Article 373; UL; NEMA.
2. Application: Panelboards, communication terminals, other purposes noted.
3. Size: As noted on drawings and as required by equipment; sufficient space to accommodate equipment and adequate gutter space for wiring, minimum 20" wide and 5-3/4" deep, unless otherwise noted.
4. Housing: Code gauge galvanized sheet steel box.
5. Front: Code gauge cold rolled sheet steel, with prime coat and light gray finish; adjustable trim clamps; mount as noted in schedule; ventilated where required.
6. Door: Hinged, with card holder frame and plastic shield inside for circuit directory; catch and lock.
7. Lock: Flush combination pin-tumbler lock and catch; all locks keyed alike, with one key for each cabinet; 3-point latch and vault handle for doors over 48". Match Department's present keying system.'
8. Accessories: As noted on drawings; other modifications as required by Project.

## 2.4 ENCLOSED CIRCUIT BREAKERS

A. Manufacturer: Square D, Siemens ITE or GE.

1. Description: Molded case circuit breaker as hereinbefore specified, enclosed NEMA 1 enclosure; arranged for cable connection on line and load side.
2. Accessories: Provisions for padlocks on handle; defeatable interlock to prevent opening cover unless breaker is off; solid neutral where required.

## 2.5 SAFETY SWITCHES

A. Manufacturer: Square D, Siemens ITE or GE.

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1. Manufacturer's description: Type HD
2. Standards: NEC Article 240; UL; NEMA.
3. Description: Metal enclosed switch with quick-make, quick-break mechanism; horsepower rated where used on motor circuits; fused or unfused as indicated; NEMA 1 or 3R enclosure as required, with external operating handle.
4. Accessories: Provision for padlocks on handle; defeatable interlock to prevent opening cover unless switch is off.
5. Fusing: NEC clips, rejection type.

## 2.6 FIELD SERVICE CABINETS

- A. The equipment cabinet shall be heavy-wall cast aluminum with gasketed doors, equipped with a lock equal to Fleming "ML" Series as required. Door opening dimensions shall be at least 37"H x 25"W. Cabinet depth shall be 12" minimum. Larger cabinets shall be provided to suit equipment. Equipment shall be mounted on 3.4 inch painted plywood mounting board, which shall be fastened to the back of the interior. All conduit entries shall be via threaded hubs.

or

- B. The equipment cabinet shall be .125 thick stainless steel enclosure Model ATS#10-1016 as manufactured by Advance Transit Services, Inc., Frank B. Clayton's Sons, Inc. or Penn Panel and Box Company. Provide enclosures as shown on drawings. The enclosure door frame shall be doubled flanged out on all four sides to increase strength of opening and keep all dust and liquids from entering the cabinet when the door is open. All exterior seams to be continuously welded and ground smooth. All external hardware shall be stainless steel. Enclosure shall have an open bottom for pad mounting. Enclosures shall contain 3/4" exterior grade plywood backpanels. Enclosures shall have ventilating holes top and bottom of enclosures. The door shall be equipped with a three point latching mechanism with nylon rollers at top and bottom. Door handle is 3/4" diameter stainless steel and has provisions for padlocking. Door lock shall be Corbin No. 15481RS (Right Hand) and Key no. Corbin 1R6382. Door shall be sealed with closed cell gasket. Door shall have heavy gauge continuous hinge with 1/4" diameter stainless steel hinge pin. Hinge shall be secured with 1/4-20 stainless steel carriage bolts and stainless steel nylock nuts. Provide stainless steel anchor bolts and nuts to install the enclosure on concrete pad. Finish shall be natural stainless steel.

## PART 3 - EXECUTION

### 3.1 PANELBOARDS

- A. Provide panelboards with molded case circuit breakers. Provide handle locking attachments for all circuit breakers serving emergency lights, exit lights, and other functions indicated. Where lighting is controlled from panelboard, provide handle locking attachment for all circuit breakers other than those for lights. Provide handle padlock attachment for breakers feeding outside lighting.
- B. Refer to cable sizes on single line diagram for size and configuration of lugs. Refer to panel schedules for requirements such as main breakers, shunt trip, auxiliary contacts, and other accessories and modifications.
- C. Use panelboard with ground bus where separate grounding conductor is used and elsewhere as indicated. Keep ground bus insulated from neutral bus. Bond ground bus to panelboard cabinet.

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- D. Mount panelboard on 3/4" exterior grade plywood mounting panel painted on all sides with two coats of black enamel paint.
- E. Include neatly typed circuit directory (inside door) for each new and existing panelboard included in the project, indicating equipment supplied from each circuit breaker.

### 3.2 CABINETS

- A. Size cabinets to accommodate all equipment therein without crowding, and as noted in schedule. For panelboards, size gutters to meet NEC requirements. Provide cabinets with extra gutter space for double-lugged feeders, feeder splices, taps, compression lugs and cables passing through. For conduit risers allow extra space at side or in rear of cabinets. Provide a minimum of 1/4" air space behind all surface mounted cabinets to allow air circulation.

### 3.3 SAFETY SWITCHES

- A. Provide safety switches rated for current and number of poles as shown on drawing. Use horsepower rated switches on motor circuits. Match voltage rating with system voltage. Use NEMA 1 enclosure indoors and NEMA 3R raintight enclosure outdoors unless otherwise noted. Use fused switches unless otherwise noted. For motor disconnecting means, circuit control wiring through auxiliary contact to disconnect all power to motor and controller when switch is opened. Connect solid neutral where it is required.

### 3.4 FUSES

- A. Provide a properly sized fuse for each fuse holder in the project. Include fuses for holders furnished under other Divisions of the Specifications, and under other contracts. In addition furnish a 10% complement of spare fuses of each type and size, and not less than 3 of each type and size.
  - 1. Provide time delay fuses, for all fuse holders.
  - 2. Provide other types of fuses as required by the Project.

### 3.5 FIELD SERVICE CABINETS

- A. Equipment shall be arranged so that meters, if any, can be read without exposing the meter reader to live parts, including current transformers.
- B. The cabinet shall be mounted as shown. Pad-mounted cabinets shall be fastened by means of bolts, channels or angles into the pad. Pad-mounting method shall be approved by the Department.

### 3.6 CONCRETE PADS

- A. Concrete pads for field service cabinets shall be furnished by the Electrical Contractor. Concrete pads shall be complete with anchor bolts located from templates furnished by the manufacturer and shall be reinforced according to the manufacturer's recommendations.
- B. Concrete shall have a minimum compressive strength of 3500 PSI after 28 days.

**SECTION 260526 –  
GROUNDING AND BONDING**

1.1           QUALITY ASSURANCE

- A. Quality Standard for Grounding and Bonding Materials and Equipment: UL 467.

1.2           PRODUCTS

- A. Insulated Conductors: Copper wire or cable.
- B. Bare Copper Conductors:
  - 1. Solid conductors.
  - 2. Stranded conductors.
  - 3. Tinned conductors.
  - 4. Stranded bonding conductors.
  - 5. Copper tape braided bonding jumpers.
  - 6. Tinned-copper braided bonding jumpers.
- C. Grounding Bus: Predrilled rectangular copper bars with stand-off insulators.
- D. Connectors: Bolted and exothermic-welded type.
- E. Grounding Electrodes:
  - 1. Ground Rods: Copper-clad steel.

1.3           FIELD QUALITY CONTROL

- A. Ground Resistance Testing: By Contractor-engaged agency.

**SECTION 262713  
ELECTRICAL METERING**

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. Section 260500 - General Electrical Provisions.

1.2 GENERAL REQUIREMENTS

- A. If required, Electric service shall be obtained from the lines of the PECO Energy Company, as indicated on the drawings, in strict compliance with the requirements of the Power Company and shall include all required metering facilities.

PART 2 - PRODUCTS

2.1 RACEWAYS AND CONDUCTORS

- A. Refer to Section 260100 - Wiring Materials and Methods.

PART 3 - EXECUTION

3.1 APPLICATION FOR SERVICE

- A. The Contractor shall submit a Service and Meter Application on the form furnished by PECO Energy Company prior to the start of work.

3.2 COORDINATION WITH OTHER UTILITIES

- A. The Contractor shall place "One-Call" to determine the locations of utilities, in the area of the work, that may be compromised or otherwise interfere with the work of this Contract. Any conflict found shall immediately be reported to the Department.
- B. The Contractor shall make all arrangements, secure necessary approvals, coordinate the work and notify each involved utility of trench openings, installation of raceways, conductors and trench closings.

3.3 POWER COMPANY RESPONSIBILITIES

- A. PECO Energy Company will furnish current transformers, as required.
- B. PECO Energy Company will make final connections to their lines.

3.4

CONTRACTOR RESPONSIBILITIES

- A. Confer and cooperate with PECO Energy Company in arranging for the installation, location and details of the incoming service. Pay all charges that may be levied by the Power Company for extraordinary work that they may be required to perform in conjunction with supplying service to the Project.
- B. Obtain approval of metering location and details from Power Company, prior to installation.
- C. Provide all required excavation, backfilling and restoration required for the installation of the electric service. If required, backfilling shall be done under the direction of a PECO Energy Company field inspector.
- D. Provide underground raceways, conductors, hand holes and other equipment and appurtenances required for a complete electric service installation.
- E. Provide all required metering facilities, where indicated, including meter sockets, troughs, junction boxes, current transformer enclosures, special channels and all accessories required by the Power Company for the installation of their metering instruments. Confer with PECO Energy Company to ascertain all items required for metering installation, prior to submitting bid.
- F. Install current transformers furnished by PECO.

**SECTION 265119**  
**LED INTERIOR LIGHTING**

1.1 WARRANTY

- A. Materials and Workmanship for Luminaires: Five years.

1.2 PRODUCTS

- A. Operating Nominal Voltage is dependent on service. Multi-voltage drivers are preferred.

- B. Luminaire Types:

- 1. Cylinder.
- 2. Downlight.
- 3. Pole mounted Parking lights.
- 4. Recessed linear.
- 5. Strip light.
- 6. Surface mount, linear.
- 7. Surface mount, nonlinear.
- 8. Suspended, linear.
- 9. Suspended, nonlinear.

1.3 MATERIALS

- A. Lighting Diffusers: prismatic glass.

- B. Housings:

- 1. Vandal resistant
- 2. Extruded-aluminum housing and heat sink.
- 3. Color and finish selected by Architect.

- C. Factory-applied labels: Labels shall include the following lamp characteristics:

- 1. "USE ONLY" and include specific lamp type.
- 2. Lamp diameter, shape, size, wattage, and coating.
- 3. CCT and CRI for all luminaires.

- D. Fixture Support Components:

- 1. Single-Stem Hangers: Steel tubing with swivel ball fittings and ceiling canopy.
- 2. Wires: Soft temper, zinc-coated steel, 12 gage.
- 3. Rod Hangers: Cadmium-plated, threaded steel rod.
- 4. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.
- 5. Provide safety cable connected to structural member.

**SECTION 265219  
EMERGENCY AND EXIT LIGHTING**

1.1 WARRANTY

- A. Materials and Workmanship for Luminaires and Emergency Lighting Batteries: Two years.

1.2 GENERAL REQUIREMENTS FOR EMERGENCY LIGHTING

- A. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within luminaire body.
1. Emergency Connection: Operate lamp(s) continuously at an output of 1100 lumens each upon loss of normal power.
  2. Automatically operating relay.
  3. Nightlight connection to operate fixture continuously at 40 percent of rated lumens output.
  4. Test push-button and indicator light.
  5. Sealed, maintenance-free, nickel-cadmium battery.
  6. Fully automatic, solid-state, constant-current charger.
  7. Remote test switch.
  8. Automatic, integral self-test electronic device.
- B. External Type: Self-contained, modular, battery-inverter unit, suitable for powering one or more lamps, remote mounted from luminaire.
1. Emergency Connection: Operate two lamp(s) continuously at an output of 1100 lumens each upon loss of normal power.
  2. Automatically operating relay.
  3. Nightlight connection to operate lamp continuously at 40 percent of rated light output.
  4. Sealed, maintenance-free, nickel-cadmium battery.
  5. Fully automatic, solid-state, constant-current charger.
  6. Test push-button and indicator light.
  7. Remote test switch.
  8. Automatic, integral self-test electronic device.

1.3 EMERGENCY LIGHTING

- A. System Description: Self-contained emergency lighting assemblies.
1. Emergency Luminaires:
    - a. Internal External emergency power unit.
    - b. Operating at nominal voltage of 120 V ac.
    - c. Rated for installation in damp locations and for sealed and gasketed fixtures in wet locations.
  2. Emergency Lighting Unit:
    - a. Operating at nominal voltage of 120 V ac.
    - b. Wall mount with universal junction box adaptor.
    - c. UV stable thermoplastic housing, rated for damp locations.

- d. Two LED lamp heads.
  - e. Internal emergency power unit.
3. Remote Emergency Lighting Unit:
- a. Operating at nominal voltage of 120 V ac.
  - b. Wall mount with universal junction box adaptor.
  - c. UV stable thermoplastic housing, rated for damp locations.
  - d. Two LED lamp heads.
  - e. Emergency connection.
  - f. Automatically operating relay.
  - g. Test push-button and indicator light.
  - h. Automatic, integral self-test electronic device.

#### 1.4 EXIT SIGNS

##### A. System Description: Exit Signs.

- 1. Internally Lighted Signs:
  - a. Operating at nominal voltage of 120 V ac.
  - b. Lamps for AC Operation: LED, two for each fixture; 50,000 hours of rated lamp life.
  - c. Self-powered exit signs with internal emergency power unit.

#### 1.5 MATERIALS

##### A. Housings:

- 1. Vandal resistant.
- 2. Extruded aluminum housing and heat sink.
- 3. Color and finish selected by Architect.

##### B. Lighting Diffusers: Prismatic glass.

##### C. Batteries: Nickel cadmium.

##### D. Lamps: LED.



**SECTION 265668**  
**EXTERIOR ATHLETIC LIGHTING**

**PART 1 – GENERAL**

**1.1 PERFORMANCE REQUIREMENTS**

- A. Lighting design: If not supplied by the City, the lighting design shall be provided by the Contractor and the selected lighting manufacturer. Light poles and foundations shall be designed for applicable code requirements for wind loading and weight. Light pole foundations designs shall be prepared by a qualified structural engineer licensed as Professional Engineer in the Commonwealth of Pennsylvania.
- B. Facility Type: Recreational or social facility.
- C. Illuminance Calculations: Computer-analyzed point method for grid pattern dimensions and glare control.
- D. Electric Power: Dependent on service provided. Multi-voltage drivers or ballasts are preferred.
- E. Baseball Fields:
  - 1. IESNA RP-6, Class of Play: I.
  - 2. Speed of Sport: Slow.
  - 3. Grid Pattern Dimensions: 30 by 30 feet.
- F. Softball Fields:
  - 1. IESNA RP-6, Class of Play: I.
  - 2. Speed of Sport: Slow.
  - 3. Grid Pattern Dimensions: 20 by 20 feet.
- G. Football Fields:
  - 1. IESNA RP-6, Class of Play: I.
  - 2. Speed of Sport: Slow.
  - 3. Grid Pattern Dimensions: 30 by 30 feet.
- H. Basketball:
  - 1. IESNA RP-6, Class of Play: I.
  - 2. Speed of Sport: Slow.
  - 3. Grid Pattern Dimensions: 10 by 10 feet.

**1.2 FIELD QUALITY CONTROL**

- I. Testing: By a qualified electrical inspection agent hired by the Contractor.

## PART 2 – PRODUCTS

### 2.2 COMPONENTS

- A. Lighting Control: Manual, low voltage, or digital.
- B. Electric Power: Dependent on service provided. Multi-voltage drivers or ballasts are preferred.
- C. Luminaires:
  - 1. Spill-light control devices.
  - 2. Bracket-mounted, full-cutoff type with integral drivers.
  - 3. LED, rated up to 1000 W.
- D. Driver Mounting: At location of associated luminaires.
- E. Support Structures: Light Standards for Sports lighting use shall be complete assemblies of 30'- 0" to 80'-0" high poles with the number of luminaries indicated on the drawings.
- F. Poles shall be round tapered galvanized steel or aluminum, heights as specified with 4" x 6" hand hole (tamperproof screws), vibration dampener and nut covers at base. Finish of poles shall be black. Color shall be approved by Philadelphia Parks and Recreation.
  - 1. Basketball Court Poles: 30'-0" high
  - 2. Athletic Field Light Poles: 55'-0" high
- G. Poles shall be provided with single, double, triple or quad arm pole top brackets for the configurations indicated.
- H. Poles shall be per Lighting Manufacturer's recommendations or equal to sports lighting poles manufactured by Valmont Industries, Inc.
- I. Pole Foundations: Reinforced concrete, min. 4,000 psi at 28 days, designed by a qualified structural engineer licensed as Professional Engineer in the Commonwealth of Pennsylvania.
- J. Wiring below Grade: Nonmetallic raceway.
- K. Weatherproof electrical enclosures.
- L. Panelboard surge suppressors.
- M. Pole Protection: Polyfoam pole pads.

### 2.3 APPROVED MANUFACTURERS

- A. Musco Lighting – 100 1st Avenue West, P.O. Box 808, Oskaloosa, IA 52577, Phone: (800) 825.6030, E-mail: [lighting@musco.com](mailto:lighting@musco.com), Web: <https://www.musco.com/>
- B. Eaton Sport Lighting – 1000 Cherrington Parkway, Moon Township, PA 15108, Phone: (412) 893-3300, Web: <https://www.eaton.com/>.

C. Philadelphia Parks and Recreation (PPR) approved equal.

2.4 FLOODLIGHTS (Up to 1000 watt)

- A. Light Fixtures for Court Lights and Athletic Field Lights shall be provided by Owner. Contractor shall install lights on poles at specified locations provided on Drawings.
- B.
- C. Floodlights shall be LED of the voltage and wattage shown. Drivers shall be integral, prewired, - 20 degrees F.
- D. Drivers and lamps shall be standard "off the shelf" items supplied by at least two manufacturers.
- E. Reflectors for round general purpose floodlights shall be one-piece, symmetrical, end-punched spun aluminum, of sphero-parabolic shape. Reflectors shall be protected by heavy-duty cast aluminum outer housing.
- F. Reflectors for rectangular floodlights shall be hydro-formed, semi-specular anodized aluminum protected by a die-cast aluminum housing.
- G. Lenses shall be clear flat, high-strength heat-resistant tempered glass, mounted with a one-piece silicone rubber gasket into a hinged stainless steel or cast aluminum lens frame or clear fluorinated hydrocarbon, 5 mil. minimum thickness, in a suitable frame. The lens frame shall be secured in at least four points with captive stainless steel hardware, producing a water-tight seal.
- H. Lenses shall be protected by a heavy gauge (.048) framed and welded stainless steel guard (3/4" x 3/4" grid) mounted to the lens frame with 1 inch stand-off bolts and tubing. Guard shall be furnished by luminaire manufacturer.
- I. Integral driver housing shall be cast aluminum, with captive stainless steel access fasteners. The driver housing shall be physically and thermally isolated from the lamp socket and the optical assembly.
- J. All wiring between the power source and the driver, and between the driver and the lamp socket, shall be completely enclosed in a watertight metal structure, such as liquid tight flexible conduit.
- K. The entire floodlight including all wiring, shall be completely watertight and dust-tight even after repeated opening for lamp replacement and/or servicing.
- L. Floodlights shall be complete with rifle-type aiming sight, vertical degree scale, lockable repositioning device and two locking screws. Mounting shall be via two-inch slipfitter.
- M. Floodlights shall be mounted not less than 30 feet above finished grade.
- N. Each floodlight shall be furnished with a 1/8 inch stainless steel safety cable. Cable shall be supplied by the floodlight manufacturer.
- O. Each 250 watt HPS floodlight proposed for vandal lighting application shall be furnished with a twist-lock type photocell receptacle and compatible photocell, as previously specified.

## 2.5 POLES FOR SPORTS LIGHTING

- A. Poles up to 40 feet in height shall be one-piece, tapered, spun aluminum, unless the applied loading exceeds the maximum rating of the heaviest available aluminum pole. If maximum rating is exceeded, use galvanized steel as specified herein. Poles greater than 40 feet in height may be round or octagonal, tapered, galvanized steel. Galvanizing on shaft shall meet all the requirements of ASTM A 123 and shall be factory applied by the pole manufacturer. All poles greater than 40 feet shall be provided with safety climbing device and pole steps above 40 feet (double steps at 5'-6" and 6'-9" from top of pole). Poles shall include a 4" x 6" handhole with tamperproof screws, vibration dampener and nut covers at base. Finish of poles shall be black.
  - 1. Basketball Court Poles: 30'-0" high
  - 2. Athletic Field Light Poles: 55'-0" high
- B. Finish for all poles shall be 25 year life design.
- C. Poles shall be supplied complete with mounting bolts, template and manufacturers recommendations for reinforced concrete foundations. Anchor bolts shall be of such material and finish as to remain free from rust for the life of the installation.
- D. Complete installations of foundations, bolts, poles, floodlights and bracket arms or platforms, shall withstand winds to 80 mph, with gusts to 104 mph, without loosening, leaning or sustaining any other damage. All poles of each size shall be designed to withstand the wind loading of the maximum number of floodlights used on each project for that size.
- E. The Electrical Contractor shall be responsible for the construction of pole foundations and for setting the poles. Tops of foundations shall be at least twelve inches above grade with a one-inch chamfer all around.
- F. Poles shall be complete with a gasketed, covered handhole for wiring. Cover hardware shall be tamper-proof.
- G. After final leveling and tightening of pole base securing nuts, installations shall be made tamper-proof by filling at least three (3) threads above the nuts with plastic steel and by placing appropriate loctite compound under and around the bottom nuts.
- H. Bracket arms shall be provided by the pole manufacturer and shall be constructed of the same material as the pole on which they are mounted. Steel brackets shall consist of 2-3/8 inch steel tubular arm members welded to a bracket slipfitter. Slipfitter and arm members shall be fabricated from structural quality hot rolled carbon steel with a guaranteed minimum yield strength of 30,000 psi. The bracket shall include an internal weather resistant wiring raceway (1-1/8 inch minimum) and commercial quality steel wedge cap when required. Galvanized finish of steel brackets shall meet all the requirements of ASTM A 123.
- I. Platforms shall be provided by the pole manufacturer and shall be constructed of galvanized tubular members to effectively reduce wind drag. The cage shall consist of at least one horizontal steel supporting member, a minimum of 5-1/2 inch OD, 10 gauge material and vertical luminaire supports of 2 inch Schedule 40 pipe. All angles shall conform to ASTM designation A36. The vertical luminaire supports shall be available with horizontal, angle luminaire supports with holes to accommodate luminaire adapter plates or pipe tenons to accommodate specific size slipfitters.

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All pipe and tubing components shall be 35 KS1 minimum yield strength. The platform shall be caged with vertical members, minimum 46 inches in height with two horizontal 3/16 inch diameter, 7 x 19 galvanized aircraft cables for enclosure and safety support of maintenance person. The floor shall be 3 pound expanded metal grating. The floor shall incorporate a hinged door for access to the cage and shall be capable of closing prior to uncoupling of climbing safety device. The entire basket shall allow for internal wiring from the pole shaft to the luminaire mounting supports. The pole top mounting bracket shall have internal drip shielding for wire entrance. Finish shall meet all the requirements of ASTM A123.

- J. Shop drawings for lighting poles shall be accompanied by the manufacturers certification for wind loading. Calculations of pole & bolt requirements shall be included indicating a safety factor of 2.0, based on ASSHTO Standards. The certification shall state the maximum EPA which may be imposed at full pole height and at the specified velocity. The Contractor shall append a list of EPA actually imposed on each pole in the installation. Shop drawings submitted without either one of these documents will be considered unacceptable.

## 2.6 LIGHT STANDARDS

- A. Light Fixtures for Court Lights and Athletic Field Lights shall be provided by Owner. Contractor shall install lights on poles at specified locations provided on Drawings.
- B. Poles shall be provided with single, double, triple or quad arm pole top brackets for the configurations indicated.
- C. Poles shall be per Lighting Manufacturer's recommendations or equal to sports lighting poles manufactured by Valmont Industries, Inc.
- D. Luminaires shall be heavy duty aluminum weatherproof body with internal aluminum reinforcing back plate. It shall have a removable hinged extruded aluminum lens frame with ¼ turn, captive fasteners for easy lamp accessibility. A one piece E.P.D.M. high temperature gasket shall tightly seal the tempered glass lens and the extruded frame, eliminating bugs and light leaks. The lamp socket shall be a porcelain lamp grip socket with nickel plated screw shell and spring loaded contact. Additional lens protection shall be provided using heavy gauge (.048) framed and welded stainless steel guard (3/4" x 3/4" grid) mounted to the lens frame with 1 inch stand-off bolts and tubing. Guard shall be furnished by luminaire manufacturer.
- E. Luminaire reflector system shall be hydro-formed Alzak aluminum, designed to produce IES distribution Types II, III and IV as required.
- F. Finish of luminaire shall be pre-treated, primed baked, covered with a high solids polyester finish and baked again. The double finish shall meet or exceed all AAMA requirements for 1000 hour salt spray exposure. Color shall match poles.

## PART 3 - EXECUTION

### 3.1 POLE LOCATIONS

- A. All poles locations shall be staked and locations approved by the Department prior to starting any work. Pole locations shown on the drawings are approximate.

### 3.2 DISTRIBUTION AND AIMING DIAGRAMS

- A. The Contractor shall obtain from the manufacturer of the floodlighting luminaries proposed for use on each project, computer generated Illuminance Distribution and Aiming Diagram for each sport indicated. The diagrams shall be submitted for approval with the luminaire shop drawings. Diagrams shall be prepared at a scale of not less than 20 feet to the inch on a grid of 1 inch by 1 inch.
- B. Final selection of beam spreads for each floodlight shall be based on the diagrams submitted and approved. Beam spreads used to generate the diagrams shall be indicated for each floodlight submission.
- C. The minimum criteria for acceptance shall be as follows:
  - 1. Average maintained illuminance shall meet or exceed current I.E.S Standards.
  - 2. Maximum to minimum illuminance shall not exceed a ratio of 3 to 1 for any sport.
  - 3. Average illuminance of infield shall be at least 1.5 times greater than outfield for softball and baseball fields.

### 3.3 POLE BASES

- A. Provide concrete bases for all lighting poles, as required. Bases shall be as recommended by the pole manufacturer, for the maximum EPA rating of the poles, at the specified wind loading. Pole base details shown on the drawings are the minimum that shall be installed.
- B. Concrete shall have a minimum compressive strength of 4000 p.s.i. after 28 days.

### 3.4 ANCHOR BOLTS

- A. Anchor bolts of the hook type and of proper size and length, as required for the various equipment specified hereinafter, shall be furnished and set by the Electrical Contractor, before any concrete is poured.
- B. This Contractor shall be responsible for the location and sizes of the anchor bolts. Anchor bolts shall be sized for the maximum EPA rating of the poles, at the specified wind loading, with a minimum yield of 55,000 psi.
- C. Anchor bolts shall be of such material and finish as to remain free from rust for the life of the installation.

### 3.5 NIGHT SET-UP AND FINAL ADJUSTMENTS

- A. The Contractor shall layout a grid on the playing areas using the approved aiming diagram using appropriate markers placed on the field. Using the aiming sights provided with the luminaries, the Contractor shall carefully direct each light at the appropriate marker on the field.
- B. Final adjustments, if required, shall be made at night in the presence of Department representatives. After final approval of the system, all moveable parts of luminaries shall be secured.

**SECTION 311000  
SITE CLEARING**

**PART 1 - GENERAL**

**1.1 GENERAL PROVISIONS**

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

**1.2 DESCRIPTION OF WORK**

- A. Work Included: Provide labor, materials, and equipment necessary to complete the work of this Section, including but not limited to the following:

- 1. Protection of existing vegetation to remain.
- 2. Removing above-grade site improvements.
- 3. Disconnecting, capping or sealing, and abandoning site utilities in place.
- 4. Disconnecting, capping or sealing, and removing site utilities.

- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

- 1. Section 015713 – TEMPORARY EROSION AND SEDIMENT CONTROL
- 2. Section 311316 – TREE PROTECTION AND PRUNING
- 3. Section 312000 – EARTH MOVING

**1.3 SUBMITTALS**

- A. Product Data: For each type of product listed, include construction details and materials.

## 1.4 QUALITY ASSURANCE

- A. Experienced Workers: Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.
  
- B. Codes and Standards: Perform work in compliance with applicable requirements of governing authorities having jurisdiction. Construction operations shall be carried out in a manner such that soil erosion, air pollution, and water pollution is minimized. State, County, and Municipal laws concerning pollution abatement shall be followed, including all applicable City of Philadelphia, Philadelphia Water Department, and PA DEP codes and regulations.

## 1.5 PROCEDURES

- A. Site Access: Minimize interference with adjoining walks and other adjacent occupied or used facilities during site-clearing operations. Maintain accessibility as required by drawings and requirements of the Owner.
  - 1. The contractor is required to maintain access to existing buildings at all times.
  - 2. Provide alternate routes around closed or obstructed access ways and walks during each phase of construction.
  
- B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises per Owner direction. Reuse item as indicated on Construction Documents.
  
- C. Notify PA One Call for area where Project is located before site clearing.
  
- D. Protection of persons and property:
  - 1. Barricade open depressions and holes occurring as part of this work and post warning lights on property adjacent to or with public access.
  - 2. If applicable, operate warning lights during hours from dawn to dusk each day and as otherwise required.
  - 3. Protect structures, utilities, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by operations under this Section.



4. Certain present underground utilities may be indicated on the drawings in their approximate locations. The Contractor shall exercise extreme caution in excavation in the immediate vicinity of these utilities so that they may not be damaged or their service interrupted. It is mandatory that these utilities be kept in continuous operation and the Contractor will be held responsible for any inconvenience or financial loss to the Owner resulting from carelessness or ineptness of the Contractor in executing this part of the work.
  5. Any sewers, pipes, conduits or systems in active use encountered during excavation are to be protected or diverted as directed by the Engineer and left in satisfactory working condition.
  6. Sewers, pipes or conduits that have been abandoned may be cut off and securely capped or plugged at the limits of excavation.
  7. It shall be the duty of the Contractor to ascertain from the Owner or utility owner where such services are in active use, or have been abandoned before proceeding as specified.
  8. The Contractor shall exercise due caution not to damage present manhole, inlet basins, or other items of underground construction which are to remain.
- E. Protect existing trees outside of construction limits. Refer to Section 311316 “Tree Protection and Pruning”
- F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
- G. Materials Ownership
1. All debris shall be hauled offsite.
  2. Topsoil shall be removed and stockpiled on site.
  3. Material to be retained/recycled by the Owner shall be removed and stored per the direction of the Owner.
  4. The Contractor shall remove from the site, recycle, or dispose of all building materials and wastes in accordance with the PaDEP Solid Waste Management regulations 25 PA Code 260, et seq. and 281.1 et seq.

5. Except for materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from the site and disposed of in a legal manner.

## PART 2 - PRODUCTS

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Locate and clearly flag trees and vegetation to remain or to be relocated.
- D. Protect existing site improvements to remain from damage during construction.
- E. Restore damaged improvements to their original conditions, as acceptable to the Owner.

### 3.2 TREES AND PLANT PROTECTION

- A. Refer to Section 31 13 19, "Temporary Tree and Plant Protection" for requirements.

### 3.3 UTILITIES

- A. Locate, identify, disconnect and seal or cap off all utilities indicated to be removed.
  1. If required, arrange to shut off indicated utilities with utility companies or Owner.
- B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to the requirements indicated:
  1. Notify Owner not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Owner's written permission.

### 3.4 CLEARING AND GRUBBING

A. Existing topsoil to be removed and hauled off-site.

B. Existing vegetation

1. Do not remove trees, shrubs, and other vegetation indicated to remain.

2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.

3. Use only hand methods.

C. No burning is allowed.

### 3.5 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, walls, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

### 3.6 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property, unless otherwise directed.

B. Recycling: All locally recyclable materials should be separated and disposed of at local recycling facility

PART 4 - END OF SECTION 311000

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**SECTION 311316**  
**TREE PROTECTION AND PRUNING**

**PART 1 – GENERAL**

**1.1 SUMMARY**

- A. Section includes general protection and pruning of existing trees that are affected by execution of the Work, whether temporary or permanent construction.
- B. Related Sections:
  - 1. Section 311000 "Site Clearing" for removing existing trees.

**1.2 DEFINITIONS**

- C. Caliper: Diameter of a trunk measured by a diameter tape at 6 inches (150 mm) above the ground for trees up to, and including, 4-inch (100-mm) size; and 12 inches (300 mm) above the ground for trees larger than 4-inch (100-mm) size.
- D. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and indicated on Drawings.

**1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each type of the following:
  - 1. Organic Mulch: 1-quart (1-L) volume of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
- C. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
  - 1. Species and size of tree.
  - 2. Location on site plan. Include unique identifier for each.
  - 3. Reason for pruning.
  - 4. Description of pruning to be performed.
  - 5. Description of maintenance following pruning.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified arborist and tree service firm.
- B. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.
- C. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.
- D. Existing Conditions: Documentation of existing trees indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.
  - 1. Use sufficiently detailed photographs or videotape.
  - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree designated to remain.

#### 1.5 QUALITY ASSURANCE

- A. Arborist Qualifications: Certified Arborist as certified by ISA.
- B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.
- C. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review methods and procedures related to temporary tree protection including, but not limited to, the following:
    - a. Construction schedule. Verify availability of materials, personnel, and equipment needed to make progress and avoid delays.
    - b. Enforcing requirements for protection zones.
    - c. Arborist's responsibilities.
    - d. Field quality control.

## 2.

#### 1.6 PROJECT CONDITIONS

- A. The following practices are prohibited within protection zones:
  - 1. Storage of construction materials, debris, or excavated material.
  - 2. Parking vehicles or equipment.
  - 3. Foot traffic.

4. Erection of sheds or structures.
  5. Impoundment of water.
  6. Excavation or other digging unless otherwise indicated.
  7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- B. Do not direct vehicle or equipment exhaust toward protection zones.
- C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Topsoil: Imported or manufactured topsoil complying with ASTM D 5268.
- B. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees, consisting of one of the following:
1. Type: Shredded hardwood, ground or shredded bark, or wood and bark chips.
  2. Size Range: 3 inches (76 mm) maximum, 1/2 inch (13 mm) minimum.
  3. Color: Natural.
- C. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements. Previously used materials may be used when approved by Architect.
1. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide galvanized-steel bases for supporting posts.
    - a. Height: 6 feet (1.8 m).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

- B. For the record, prepare written report, endorsed by arborist, listing conditions detrimental to tree protection.

## 1.2 PREPARATION

- A. Locate and clearly identify trees to remain, and review and locate shrubs to be salvaged or to be relocated. Tie a 1-inch (25-mm) blue-vinyl tape around each tree trunk at 54 inches (1372 mm) above the ground, and use similar means to identify each shrub to be salvaged.
  - 1. Coordinate shrub transplanting with Owner.
- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.
- C. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated.
  - 1. Apply 6-inch (150-mm) average thickness of organic mulch. Do not place mulch within 6 inches (150 mm) of tree trunks.

## 1.3 TREE-PROTECTION ZONES

- A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people and animals from easily entering protected area except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.
- B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect. Install one sign spaced approximately every 20 feet (6 m) on protection-zone fencing, but no fewer than four signs with each facing a different direction.
- C. Maintain protection zones free of weeds and trash.
- D. Repair or replace trees indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.
- E. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.
  - 1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
  - 2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.



## 1.4 EXCAVATION

- A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 312000 "Earth Moving."
- B. Trenching near Trees: Where utility trenches are required within protection zones, hand excavate under or around tree roots or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning.
- C. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, review conditions with Architect to determine course of action. If root pruning is determined to be an option, cut roots approximately 3 inches (75 mm) back from new construction and as required for root pruning.
- D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

## 1.5 ROOT PRUNING

- A. General: Prune roots as determined in consultation with Architect and according to the following requirements.
- B. Prune roots that are affected by temporary and permanent construction. Prune roots as follows:
  - 1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
  - 2. Cut Ends: Do not paint cut root ends.
  - 3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
  - 4. Cover exposed roots with burlap and water regularly.
  - 5. Backfill as soon as possible according to requirements in Section 312000 "Earth Moving."

- C. Root Pruning within Protection Zone: Clear and excavate by hand to the depth of the required excavation to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

## 1.6 CROWN PRUNING

- A. Prune branches that are affected by temporary and permanent construction. Prune branches as follows:
  - 1. Provide subsequent maintenance during Contract period as recommended by arborist.
  - 2. Pruning Standards: Prune trees according to ANSI A300 (Part 1) and the following:
    - a. Types of Pruning: Cleaning and raising.
    - b. Specialty Pruning: Vista.
  - 3. Cut branches with sharp pruning instruments; do not break or chop.
  - 4. Do not apply pruning paint to wounds.
- B. Chip removed branches and dispose of off-site.

## 1.7 REGRADING

- A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.
- B. Lowering Grade within Protection Zone: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist unless otherwise indicated.
  - 1. Root Pruning: Prune tree roots exposed by lowering the grade. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots as required for root pruning.
- C. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.
- D. Minor Fill within Protection Zone: Where existing grade is 2 inches (50 mm) or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

## 1.8 FIELD QUALITY CONTROL

- A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees indicated to remain and to prepare inspection reports.

## 1.9 REPAIR AND REPLACEMENT

- A. General: Repair or replace trees indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.
  - 1. Submit details of proposed root cutting and tree repairs.
  - 2. Have arborist perform the root cutting, branch pruning, and damage repair of trees.
  - 3. Treat damaged trunks, limbs, and roots according to arborist's written instructions.
  - 4. Perform repairs within 24 hours.
  - 5. Replace trees that cannot be repaired and restored to full-growth status, as determined by Architect.

1.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove excess excavated material, displaced trees, trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 311316

**SECTION 312000  
EARTH MOVING**

PART 1 – GENERAL

1.1 SUMMARY

- A. The work of this section includes all earthwork and related and incidental operations, including:
  - 1. Site protection, erosion and sediment control, site clearing, and sitework clearing.
  - 2. Preparing of subgrade for walkways and pavements, and sitework clearing.
  - 3. Dewatering as required to keep excavations free of water and soil erosion during construction period.
  - 4. Preparing subgrades for slabs on grade.
- B. Excavating and backfilling for underground mechanical and electrical utilities and buried mechanical and electrical appurtenances shall be by the mechanical or electrical contractor.
- C. Related Sections
  - 1. Section 015713, “Temporary Erosion and Sediment Sedimentation Controls”.

1.2 General earthwork requirements shall conform to the following minimum standards:

- A. Provide positive drainage away from all structures.
- B. Unless otherwise noted, minimum slope shall be ¼ inch per foot or 2% and a maximum slope shall not exceed 3:1 (h:v) or 33% for non-paved surfaces. Paved surfaces shall have a minimum grade or 1% and have positive drainage off of the pavement.
- C. Grades on designated handicapped accessible areas/routes shall comply with the provisions of the Americans with Disabilities Act.
- D. Notify the PPR immediately if slope requirements cannot be met. At no time will slopes in excess of those above the maximum allowed, be accepted, unless prior approval is received in writing by PPR.
- E. Grade earthen, non-paved, surfaces to a smooth finish. Slope lawn areas in swales to a gentle crown along the centerline.
- F. Grade all seeded fine lawn areas flush with finish grade. Adjust finished grade to the proper depth where sod abuts paved areas.
- G. Grade all tree/shrub/groundcover planting beds to 3 inches below top of abutting curbs, paving, or lawn areas to allow for mulching.
- H. Adjust existing and new catch basins, and drains rim/grate elevations to new grade elevations (pavement or soil).

- I. Finished surfaces shall be graded smooth and even with no abrupt or awkward changes in grade.
- J. Provide properly compacted subgrades of native soil or approved fill. Native soils, fill, or subgrades deemed insufficient shall be removed and replaced with appropriate material. Subgrades shall be inspected by a qualified inspector to ensure compaction requirements are met. Submit test reports and field logs to PPR for review and for record.
- K. Existing on-site soils should be evaluated for both suitability for use in construction as well as environmentally for contaminants by licensed and qualified professionals such as geotechnical engineers and environmental scientists. Many sites throughout the City include various types of urban fill. In some cases there may be abandoned structures below grade. These soils and features should be evaluated before design and engineering newly planned features. Also, environmental due diligence and/or testing should be completed near the beginning of design and engineering to ascertain if on-site materials are clean or regulated. Testing of existing on-site soils and materials shall comply with the requirements of Pennsylvania Department of Environmental Protection requirements for fill management whether it is determined to be clean or regulated. Submit geotechnical testing and environmental due diligence reports to PPR for review and for record.
- L. Any soil materials leaving the site or being brought to the site shall comply with the Pennsylvania Department of Environmental Protection requirements for fill management.
- M. Environmental due diligence: investigative techniques, including, but not limited to, visual property inspections, electronic data base searches, review of property ownership, review of property use history, sanborn maps, environmental questionnaires, transaction screen, analytical testing, environmental assessments or audits. Submit all environmental due diligence reports to PPR for review and for record.
- N. Exported fill materials will be tested as per the Management of Fill Policy (2020) to determine whether the materials meet the analytical criteria for Clean Fill.
- O. The materials that meet the criteria for clean fill do not require special handling. However, a Clean Fill Certification Form FP-1001 must be submitted to PADEP and retained by the owner of the property receiving the fill. PPR and Rebuild will not prepare Clean Fill Certifications.
- P. Fill material that does not qualify as clean fill is regulated fill. Regulated fill is waste and must be managed in accordance with the municipal or residual waste regulations in 25 pa code chapters 287 residual waste management or 271 municipal waste management, whichever is applicable.
- Q. Designers and contractors shall comply with the Pennsylvania Underground Utility Line Protection Law, Act 287 of 1974, as amended by Act 50 of 2017. This includes contacting the Pennsylvania One Call System or 811 as required by law.
- R. Designers and contractors, in addition to complying with the Pennsylvania Underground Utility Line Protection Law requirements shall research available utility records from the project owner for the site or facility. Upon evaluation of these records the designer or contractor can evaluate the need for extensive underground utility locating depending on the project. The designer

or contractor shall determine the need and level of underground utility located needed for the project in conformance with the American Society of Civil Engineers (ASCE) National Consensus Standard – ASCE C-I 38-02, Standard Guidelines for the Collection and Depiction of Existing Subsurface Utility Data. The designer or contractor shall determine the Quality Level of utility located required by the project, Levels D, C, B, or A. The costs associated with underground utility locating services shall be evaluated and balanced with the available utility information, conditions in the field, the type of project being proposed, the risks associated with utility conflict and/or damage, and the ability of a utility locator to obtain information. These evaluations shall be done in consultation with Philadelphia Parks and Recreation.

### 1.3 ACTION SUBMITTALS

- A. Test Reports: Submit the following reports in addition to other test reports described in subsequent sections directly to the Landscape Architect from the testing services, with a copy to the Contractor and the Owner:
  - 1. Test reports on borrow material, including USCS classification (grain size, liquid limit, plastic limit, and natural water content), Clean Fill certification, and optimum moisture-maximum density curve for standard Proctor.
  - 2. Verification of suitability of each footing subgrade material, in accordance with specified requirements.
  - 3. Field reports; in-place soil density tests.
  - 4. One optimum moisture-maximum density curve for each type of soil encountered. One USCS classification (grain size, liquid limit, plastic limit, and natural water content), Clean Fill certification and optimum moisture-maximum density curve for standard Proctor for each fill and backfill material.
  - 5. Report of actual unconfined compressive strength and/or results of bearing tests of each strata tested.

### 1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.
- B. Codes and Standards: Perform work in compliance with applicable requirements of governing authorities having jurisdiction and follow Geotechnical recommendations. Construction operations shall be carried out in a manner such that soil erosion, air pollution, and water pollution is minimized. State, County, and Municipal laws concerning pollution abatement shall be followed.
  - 1. The Standards for Soil Erosion and Sediment Control in Pennsylvania, as published by the Pa. Department of Environmental Protection, shall be applicable where the work is not specifically detailed on the accompanying drawings or by local requirements.
  - 2. Earthwork recommendations outlined in the Project's current Geotechnical Engineering Report shall be followed unless otherwise noted.

- C. The Contractor shall take action to remedy unforeseen erosion conditions and to prevent damage to adjacent properties as a result of increased runoff and/or sediment displacement. Stockpiles of wood chips, hay bales, crushed stone, and other mulches shall be held in readiness to deal immediately with emergency problems of erosion. All erosion control checks and structures shall be inspected weekly and after heavy rainfalls, and if damaged, repaired or replaced.
- D. A Geotechnical Testing Agency shall be retained by the Contractor to perform soil testing and inspection services for quality control during earthwork and site grading operations.
  - 1. The Contractor shall submit data demonstrating the qualifications of the Geotechnical Testing Agency for approval by the Architect.
  - 2. The Geotechnical Testing Agency shall be qualified according to ASTM E 329 to conduct soil materials and rock definition testing as documented according to ASTM D 3740 and ASTM E 548.
  - 3. The Geotechnical testing agency shall have on staff a professional engineer who is legally authorized to practice in the jurisdiction where the Project is located and who is experienced in providing geotechnical engineering.
  - 4. The Geotechnical Testing Agency shall perform the tests and provide the services specified below and submit test reports to the Owner and Landscape Architect. All test reports must be signed and sealed by the qualified professional engineer responsible for their preparation.
  - 5. Testing shall be performed in the presence of a county/city representative.
- E. Field Engineering: A Surveyor shall be retained by the Contractor to provide field engineering services required for proper completion of the work including but not necessarily limited to layout work and setting of grades, slopes and levels:
  - 1. The Contractor shall submit data demonstrating qualifications of persons proposed to be engaged for field engineering services for approval by the Architect.
  - 2. The surveyor shall submit documentation verifying that layout, grades, slopes and levels are in conformance with the drawings and specifications.
  - 3. The Contractor shall locate and protect control points and reference points throughout the progress of work.

## 1.5 REFERENCES

- A. Annual Book of ASTM Standards, 2005; American Society for Testing and Materials, Philadelphia, PA.
- B. Standard Specifications of the Pennsylvania Department of Transportation, Pub. 408, latest edition.
- C. Management of Fill Policy, Pennsylvania Department of Environmental Protection, January 1, 2020 (Document No. 258-2182-773).

## 1.6 PROJECT CONDITIONS

- A. Site Information

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1. Existing data was used for the basis of the design and are available to the contractor for information only. Existing conditions are not intended as representations or warranties of accuracy or continuity. The Owner will not be responsible for interpretations or conclusions drawn from this data by Contractor.
  2. Test borings and other exploratory operations may be performed by contractor, at the Contractor's option; however, no change in the Contract Sum will be authorized for such additional exploration.
- B. Site Protection: Comply with requirements specified in Temporary Erosion and Sediment Controls, Section 015713, prior to the start of, and throughout, earthwork operations.
1. Before beginning site and sitework clearing or any other construction activity, Contractor shall set up and maintain temporary fencing along the limits of construction indicated on the drawing, staked out by the Contractor, and shall notify Architect.
  2. This temporary fencing shall describe the area of protection of existing soils/vegetation to remain. Under no conditions shall this line be penetrated by any construction vehicle or construction process, including storage of materials, waste, or fill, or for any purpose without the written consent of the Architect or Owner.
  3. Temporary fencing shall be maintained in good condition throughout the work and shall be removed when work is completed.
  4. Vegetation in protected areas which is damaged due to construction activities shall be replaced or otherwise restored to the satisfaction of the Architect and at no cost to the Owner.
  5. Barricade open excavations occurring as part of this work and post with warning lights. Operate warning lights as recommended by authorities having jurisdiction.
  6. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
  7. Perform excavation by hand within dripline of large trees to remain. Protect root systems from damage or dry out dryout to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with moistened burlap.
  8. No vehicles shall be driven or parked under the canopy of trees nor shall material be stored or any construction activity take place under canopies except that directly related to work there.
- C. Protection of Existing Utilities
1. Locate existing underground utilities in the area of the work prior to the beginning of the work. Where utilities are to remain in place, provide suitable protection where required before starting work and maintain protection throughout the course of the work. Do not interrupt existing utilities without written approval from the utility owner.
    - a. Provide minimum of 48-hour notice to the Landscape Architect and receive written notice to proceed before interrupting any utility.
  2. Should uncharted or incorrectly charted utilities be encountered during excavation, consult the utility owner immediately for directions. Cooperate with the Owner and public and private utility companies in keeping their respective services and facilities in operation.



3. Restore damaged utilities to their original condition to the satisfaction of and at no cost to the Owner. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shutoff of services if lines are active.

D. Use of Explosives: Use of explosives is not permitted without the prior approval of the Architect.

## PART 2 – PRODUCTS

### 2.1 MATERIALS

- A. Class 4, Type A Geotextile: Per PENNDOT Publication 408, Section 735 with AOS 70-100 U.S. Sieve.

### 2.2 SOIL MATERIALS

- A. Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP.
- B. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.
- C. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1-1/2 inch sieve and not more than 10 percent passing a No. 4 sieve and 0% passing No. 200 sieve.
- D. Topsoil: Topsoil stripped and stockpiled on the site should be used for fine grading. Topsoil is defined as soil existing as top layer of earth on the site, which produces heavy growths of crops, grass or other vegetation. If there is not sufficient stripped and stockpiled topsoil, furnish additional topsoil as needed conforming to the requirements specified in Section 32 93 00, Plants.
- E. Fill and Backfill Materials:
  1. Fill must have a bearing capacity of at least 3,000 pounds per square foot (PSF) when compacted to 95% of the maximum dry density (ASTMD-1557 or ASTM D-698 for trenches or other small spaces where large compaction equipment is not used).
  2. Ordinary fill material shall be clean and free of high organic top soil, peat or muck, masonry materials, broken concrete or asphalt, stones larger than six inches, frozen lumps, trash, and other debris that would interfere with compaction or cause settlement.
  3. Fill material shall be of a moisture content suitable for compaction, specifically within +/- 2% of the optimum moisture content per the standard Proctor test (ASTM D698) and shall be obtained from a location that is normally dry and well-drained.
  4. Select fill material shall be PENNDOT No. 2A per PENNDOT Section 703.2.
  5. Should it be necessary to import fill material from off-site, the Contractor shall furnish certified report(s) of the testing laboratory showing the analysis of a representative sample of the material he proposes to use. A separate report shall be furnished for each source of material, including USCS classification (grain size, liquid limit, plastic limit,

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and natural water content), Clean Fill certification, and optimum moisture-maximum density curve for standard Proctor. The Contractor shall furnish the reports to the Engineer for approval. Imported fill shall be well-graded granular material similar to PADOT 2A or crushed, recycled concrete with a gradation similar to PADOT 2A.

6. Structural Fill: Clean bank run sand and gravel containing non-plastic fines for that portion passing a No. 40 U.S. Standard sieve. Conform to the following gradation.

U.S. STANDARD SIEVE SIZE	PERCENT PASSING
4 inch	100
No. 4	30 to 100
No. 200	0 to 1235

- a. Material Availability: Borrow areas for structural fill material are not available on the site. Provide off-site materials of the quality specified and quantities required. Obtain material from a single source if possible.
7. Crushed Stone: Angular, washed natural stone; free of shale, clay, friable materials and debris; graded in accordance with ANSI/ASTM C136 within the following limits:

U.S. STANDARD SIEVE	PERCENT
3/4 inch	95 to 100
5/8 inch	75 to 100
3/8 inch	55 to 85
No. 4	35 to 60
No. 16	15 to 35
No. 40	10 to 25
No. 200	5 to 10

8. Sand: Natural river or bank sand; dry, washed, free of silt, clay, loam, friable or soluble materials and organic matter; graded in accordance with ANSI/ASTM C136 within the following limits:

U.S. STANDARD SIEVE	PERCENT
No. 4	100
No. 14	10 to 100
No. 50	5 to 90
No. 100	4 to 30
No. 200	0

9. Dense Graded Aggregate: Broken stone, crushed gravel or blast furnace slag conforming to the following gradation:

U.S. STANDARD SIEVE	PERCENT FINER BY
1 inch	100
3/4 inch	55 to 90
No. 4	25 to 60
No. 50	5 to 25

No. 200	3 to 12
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10. Pea Gravel: Natural stone; washed, well rounded, clean, free flowing, free of clay, shale, organic matter; 1/4 inch minimum to 5/8 inch maximum size.
11. Porous Fill: Crushed stone aggregate conforming to the following gradation:

U.S. STANDARD SIEVE	PERCENT FINER BY
1 inch	100
3/4 inch	90
3/8 inch	30
No. 4	5
No. 8	0

12. Ballast: Coarse, crushed stone aggregate conforming to the gradation of Table C. and properties specified in PADOT 703.2

### PART 3 - EXECUTION

#### 3.1 INSPECTION

- A. Examine the areas and conditions under which earthwork and site grading is to be performed and notify the Architect in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

#### 3.2 SITE PROTECTION MEASURES

- A. All temporary erosion and sediment control measures indicated on the drawings and as specified in Section 015713 and all temporary fencing shall be in place before beginning any earthwork or sitework.
- B. Construction operations shall be carried out in a manner such that soil erosion and air and water pollution are minimized. State and local laws concerning pollution abatement shall be followed.
- C. The General Contractor shall be responsible for all soil erosion and sediment control and site protection during the construction period and shall provide barriers and other measures and devices to ensure that these specifications are complied with.
- D. Preventative measures against sinkhole formation:
  1. Provide positive drainage away from building areas and exposed rock at all times during construction.
  2. Avoid ponding water or concentrations of surface flows except where designated on the drawings.
  3. Prevent runoff water from flowing onto exposed subgrades. Close excavations as soon as possible after exposure. Foundation concrete should be placed the same day that excavation is completed.
  4. Backfill shall be compacted and be no more permeable than adjacent subgrade.

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- E. Contractor shall notify the Architect before any work is begun on the site to review temporary erosion control measures, site protection, permanent stormwater management features, and the sequence of construction.
- F. Permanent stormwater management features and additional temporary erosion control measures as indicated on drawings shall be constructed after clearing and stripping of topsoil and are to be in place before the beginning of other construction activities.
- G. No water which transports sediment resulting from earth moving, demolition, or other construction activities shall be permitted to discharge beyond the limits of disturbance or grading indicated on the drawings.

### 3.3 SITE PREPARATION

- A. Following the setting up of temporary fencing, tree protection and temporary erosion control measures as specified, remove trees, shrubs, grass and other vegetation or obstructions which interfere with new construction. Completely remove stumps of trees and shrubs which are located within ten feet of proposed new construction, including buildings, roads, etc. to at least one foot below finish grade.
- B. Strip all topsoil to the full depth of the topsoil horizon, minimum 6 inches, from the area to be disturbed by new earthwork or construction.
  - 1. Keep topsoil reasonably free from subsoil, debris, and stones larger than two inches.
  - 2. Stockpile topsoil for future use in location to be approved by the Architect. If so directed by the Architect, create separate stockpiles for different stripped areas.
  - 3. Prevent erosion of stockpiles, as specified in Section 015713.

### 3.4 EXCAVATION

- A. Excavation is unclassified and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.
- B. The Contractor shall perform excavation to the dimensions and elevations indicated on the drawings for all structures and work incidental thereto.
- C. Excavated materials to be reused for topsoil, backfill, or other purposes shall be piled away from the edge of the excavated area a sufficient distance to prevent overloading the bank, and graded in such a way as to prevent surface water from entering the excavated area. Excess material from excavation not suitable or required for backfill or other purposes shall be hauled from the site as excavated and disposed of legally.

Exposed subgrades outside of ultimate stormwater infiltration or bioretention areas shall be proof rolled with heavy pneumatic-tired equipment in the presence of the Geotechnical Testing Agency to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades. At minimum, a triaxle dump truck (loaded) with minimum tire pressure of 100 psi (Gross Vehicle Weight of 75,000 lb) should be used.

Excavate and replace soft or unstable areas of subgrade and replace with approved compacted fill as directed by the Geotechnical Testing Agency. The Contractor should refer to the pavement subgrade over excavation detail should soft or unstable areas be encountered. Over excavation should consist of 1' min to 3' max depth in areas identified as unsuitable by proof rolling, the placement of Class 4, type A geotextile, and backfilled with compacted dense graded aggregate. Use select fill material specified in 2.2.E. as PADOT 2A per 703.2 or approved crushed, recycled concrete of similar gradation.

- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Geotechnical Testing Agency.
- E. Rock Excavation: The following classifications of excavation will be made when rock is encountered:
  - 1. Earth Excavation includes excavation of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.
  - 2. Rock excavation for trenches and pits includes removal and disposal of materials and obstructions encountered that cannot be excavated with a track-mounted power excavator, equivalent to Caterpillar Model No. 215C LC, and rated at not less than 115 HP flywheel power and 32,000-pound drawbar pull and equipped with a short stick and a 42-inch wide, short tip radius rock bucket rated at 0.81 cubic yard (heaped) capacity. Trenches in excess of 10 feet in width and pits in excess of 30 feet in either length or width are classified as open excavation.
  - 3. Rock excavation in open excavations includes removal and disposal of materials and obstructions encountered that cannot be dislodged and excavated with modern, track-mounted, heavy-duty excavating equipment without drilling, blasting, or ripping. Rock excavation equipment is defined as caterpillar Model No. 973 or equivalent track-mounted loader, rated at not less than 210 HP flywheel power and developing minimum of 45,000-pound breakout force (measured in accordance with SAE J732).
    - a. Typical of materials classified as rock are boulders 1/2 cu. yd. or more in volume, solid rock, rock in ledges, and rock-hard cementitious aggregate deposits.
    - b. Intermittent drilling, blasting, or ripping performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.
  - 4. Do not perform rock excavation work until material to be excavated has been cross-sectioned and classified by Geotechnical Testing Agency. Such excavation will be paid on basis of contract conditions relative to changes in work.
  - 5. Rock payment lines are limited to the following:
    - a. Two feet outside of concrete work for which forms are required, except footings.
    - b. One foot outside perimeter of footings.
    - c. In pipe trenches, 6 inches below invert elevation of pipe and 2 feet wider than inside diameter of pipe, but not less than 3 feet minimum trench width.

- d. Outside dimensions of concrete work where no forms are required.
- e. Under slabs on grade, 6 inches below bottom of concrete slab.

F. Excavation for Structures

1. Excavation shall extend two (2) feet from the neat lines of structures to the face of bank or shoring to allow working space and inspection, except where concrete is to be deposited directly against excavated surfaces.
2. Conform to elevations and dimensions shown within a tolerance of 0.10 feet.
3. All loose material shall be removed from excavations, and bottoms shall be carefully leveled to grade.
4. Do not excavate to full depth when rain or freezing conditions are imminent. Protect completed foundation soil surface from frost.
5. The Contractor shall furnish 48 hours advance notification to the Geotechnical Testing Agency of times when footing excavations are to be completed so that the bearing quality of bottoms may be inspected and/or tested. Place no forms or concrete before approval of the excavation by the Geotechnical Testing Agency.
6. The Geotechnical Testing Agency shall inspect the open excavation to verify the bearing capacity of supporting undisturbed soil. Natural and fill soils are to have a minimum bearing capacity of 3,000 psf (pounds per square foot).
7. If the Geotechnical Testing Agency determines that unsatisfactory soil is present, or that bearing capacity at the indicated elevation is inadequate, continue excavation and replace with approved compacted load-bearing structural fill material as directed by the Geotechnical Testing Agency. Such excavation shall be classified as additional work and payment shall be made in accordance with the General Conditions.
8. If foundation subgrade is found to be unstable or directly on rock, the existing soils/rock shall be removed to a minimum depth of two feet below the proposed bottom elevation, or to a depth where firm to stiff natural soils or rock is encountered. Replace undercut areas with approved compacted load-bearing structural fill material in accordance with these specifications and as directed by the Geotechnical Engineer.

G. Excavation for Trenches

1. Trenches shall be of minimum width necessary to lay pipes and shall be excavated to exact depth and grade. Trench bottoms shall have proper and uniform grade between inverts.
2. Bottoms of all trenches shall be trimmed by hand, so that the lower one-third of pipe is continuously supported on undisturbed or compacted soil with the slope of the pipe uniform between established elevations. Bottoms of all trenches shall be hand recesses at bells, pipe couplings, valves and other protuberances.
3. Where rock or shale is encountered, the trench shall be excavated deeper as indicated below, and a layer of rock-free gravel (1/4-inch maximum size) shall be hand tamped over the trench bottom. This bed shall be a minimum of 4 inches thick for pipes 8 inches and smaller, 6 inches for pipes 10 to 20 inches, and 9 inches for pipes 24 inches and larger. Additional similar material shall be packed around the pipe to a depth of approximately 1/2 of the diameter of the pipe.
4. Whenever wet or otherwise unstable soil that is incapable of properly supporting the pipe is encountered in the bottom of the trench, such soil shall be removed to the depth required and the trench backfilled to the proper grade with a coarse sand, fine gravel, or other approved material.

#### H. Excavation for Pavements

1. Cut surface under pavements to comply with cross-sections, elevations and grades as indicated.

#### I. Stability of Excavations

1. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction.
2. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
3. Shoring and Bracing: Silty on-site soils are considered Type B per OSHA excavation regulations. The sidewalls of excavations deeper than 4 feet must be sloped, benched, or adequately shored per OSHA regulations. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.
  - a. Provide permanent steel sheet piling or pressure-treated timber sheet piling wherever subsequent removal of sheet piling might permit lateral movement of soil under adjacent structures. Cut off tops a minimum of 2'-6" below final grade and leave permanently in place.

#### J. Dewatering

1. The contractor shall pump out or otherwise remove any water which may be found in the excavation, and he shall provide drainage ditches, under-drains, flumes, well points, and pumping equipment, as necessary, to keep the excavation entirely clear of water while the foundations are being built or other operations are being performed requiring a dry condition. Do not use trench excavations as temporary drainage ditches.
2. All discharge resulting from de-watering of excavations shall be collected and diverted to facilities for removal of sediment or into a sediment filter bag and discharged over a level vegetated area. Such facilities shall be reviewed and approved by the Engineer before their construction. Water shall be conveyed to areas specified by the Engineer on-site. No water shall be run directly to streams or drains.

#### K. Cold Weather Protection

1. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

### 3.5 FILLING AND BACKFILLING

#### A. General: Place soil material in layers to required subgrade elevations, for each area classification listed below, using materials specified in Part 2 of this Section.

1. Under grassed areas, use satisfactory excavated or borrow material.

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2. Under walks and pavements, use subbase material, satisfactory excavated or borrow material or a combination.
  3. Under steps, use subbase material.
  4. Under footings and foundations use select fill material or approved imported load-bearing structural fill material.
  5. Under building slabs, use drainage fill material.
  6. Under piping and conduit and equipment, use subbase materials where required over rock bearing surface and for correction of unauthorized excavation. Shape excavation bottom to fit bottom 90 degrees of cylinder.
  7. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and that are carried below bottom of such footings or that pass under wall footings. Place concrete to level of bottom of adjacent footing.
    - a. Concrete is specified in Division 3.
    - b. Do not backfill trenches until tests and inspections have been made and backfilling is authorized by Geotechnical Testing Agency. Use care in backfilling to avoid damage or displacement of pipe systems.
  8. Provide 4-inch-thick concrete base slab support for piping or conduit less than 2'-6" below surface of roadways. After installation and testing of piping or conduit, provide minimum 4- inch-thick encasement (sides and top) of concrete prior to backfilling or placement of roadway subbase.
- B. Backfill excavations as promptly as progress of the Work permits, but not until completion of the following:
1. Acceptance of construction below finish grade including, where applicable, damp proofing, waterproofing, and perimeter insulation.
  2. Inspection, testing, approval, and recording locations of underground utilities have been performed and recorded.
  3. Removal of concrete formwork.
  4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.
  5. Removal of trash and debris from excavation.
  6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.
- C. Placing and compacting
1. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.
  2. When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.
  3. Place backfill and fill materials in layers not more than 8 10 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 6 inches in loose depth for material compacted by hand-operated tampers.



4. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
5. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.
6. Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Geotechnical Testing Agency if soil density tests indicate inadequate compaction.

- a. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density, in accordance with ASTM D698:

Under structures, building slabs and steps, pavements, and utilities compact top 12 inches of subgrade and each layer of backfill or fill material at 98 percent maximum density.

Under walkways, pavements, and utilities compact top 6 inches of subgrade and each layer of backfill or fill material at 95 percent maximum density.

Under vegetated or unpaved areas, compact top 6 inches of subgrade and each layer of backfill or fill material at 85 percent maximum density.

Under walkways, pavements, and utilities compact top 6 inches of subgrade and each layer of backfill or fill material at 95 percent maximum density.

Under bioretention areas, no compaction shall be permitted. Areas of the bioretention area compacted during the course of construction shall be harrowed or disced to restore permeability in accordance with Bioretention area specifications. If permeability cannot be restored, over-excavation and backfill with clean, open-graded stone may be required.

- b. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.
  - 1) Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
  - 2) Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.
  - 3) If aeration does not reduce the moisture content to an acceptable level, admixtures (lime, fly-ash, cement, or dry granular soil) will be required to modify moisture and aid in compaction. If admixtures are used, laboratory testing must be performed to determine the appropriate admixture(s) amounts,

maximum dry density, and optimum moisture content.

### 3.6 FIELD QUALITY CONTROL

- A. Notify Geotechnical Testing Agency for inspection and approval of subgrades and fill layers before subsequent construction is permitted thereon. Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.
  
- A. Perform field density tests in accordance with ASTM D1556 (sand cone method) or ASTM D 2167 (rubber balloon method), as applicable.
  - 1. Field density tests may also be performed by the nuclear method in accordance with ASTM D2922 ASTM D6938, providing that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D1556. In conjunction with each density calibration check, check the calibration curves furnished with the moisture gages in accordance with ASTM D3017.
  - 2. If field tests are performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of work, on each different type of material encountered, and at intervals as directed by the Geotechnical Testing Agency.
  
- C. Footing Subgrade: For each strata of soil on which footings will be placed, perform at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata when acceptable to Engineer.
  
- D. Paved Areas: Perform at least one field density test of subgrade for every 2,000 sq. ft. of paved area or building slab, but in no case fewer than three tests. In each compacted fill layer, perform one field density test for every 2,000 sq. ft. of overlaying building slab or paved area, but in no case fewer than three tests.
  
- E. Trench Backfill: Perform at least one test for each 50 feet or less of trench length, but not fewer than two three tests.
  
- F. If in opinion of Geotechnical Testing Agency, based on testing service reports and inspection, subgrade or fills that have been placed are below specified density, perform additional compaction, or remove and replace compacted fill material until specified compaction is achieved.

### 3.7 GRADING

- A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.
  
- B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:

1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10 foot above or below required subgrade elevations.
  2. Walks: Shape surface of areas under walks to line, grade, and cross-section, with finish surface not more than 0.10 foot above or below required subgrade elevation.
  3. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than 1/2 inch above or below required subgrade elevation.
- C. Grading Surface of Fill under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2 inch when tested with a 10-foot straightedge. The Surveyor shall verify that grades, slopes, and levels are in conformance with the drawings and specifications.
- D. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

### 3.8 PAVEMENT SUBBASE COURSE

- A. General: Subbase course consists of placing subbase material, in layers of specified thickness, over subgrade surface to support a pavement base course.
1. Refer to other Division 32 sections for paving specifications.
- B. Grade Control: During construction, maintain lines and grades including crown and cross-slope of subbase course.
- C. Shoulders: Place shoulders along edges of subbase course to prevent lateral movement.
- D. Construct shoulders of acceptable soil materials, placed in such quantity to compact to thickness of each subbase course layer. Compact and roll at least a 12-inch width of shoulder simultaneous with the compaction and rolling of each layer of subbase course.
- E. Placing: Place subbase course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations.
1. When a compacted subbase course is indicated to be 6 inches thick or less, place material in a single layer. When indicated to be more than 6 inches thick, place material in equal layers, except no single layer more than 6 inches or less than 3 inches in thickness when compacted.

### 3.9 TEMPORARY SEEDING

- A. Temporary seeding and mulching shall be required on all freshly graded areas immediately following earthmoving procedures. Seed-free straw or salt hay mulch shall be applied at a rate of 1 ton per acre (40 lbs. per 1000 square feet) over temporary seeded areas. Straw bale barriers shall be placed in swale areas until vegetation is established.
- B. Temporary seeding shall consist of sod, a blend of turf-type tall fescue and Kentucky Blue Grass (100 percent by weight) or equivalent and shall be placed at 30 lbs per acre or 10 lbs per 1,000 square feet.

- C. Should temporary seeding not be possible or not establish itself properly, mulch as described above, pending fine grading or permanent seeding.

### 3.10 FINISH GRADING

- A. Spreading of planting soil and finish grading shall be coordinated with the work of the Landscape Contractor and the seeding dates described in Section 32 93 00, Plants. No work shall be performed until after verification of slopes and grades as described in this Section and until after approval by the Architect.
- B. Verify that the rough grades meet requirements for tolerances, materials, and compaction.
- C. Correct washouts, swales, berms, and other irregularities to provide a smooth, uniform surface without low places where water will stand.
- D. Surface of subgrades shall be loosened and made friable by cross-discing or harrowing to a depth of 2" (inches). Stones and debris more than 1-1.5" (inches) in any dimension shall be raked up and grade stakes and rubbish removed.
- E. Planting Soil shall be per Section 32 91 15, Soil Preparation.
- F. Permanent seeding work shall be begun within one week of the completion of fine grading. If grading is completed at a time of the year when seeding work is not to be done or if this is otherwise not possible, mulch entire area with seed-free salt straw or salt hay at a rate of one ton per acre. Anchor mulch with a mulch binder approved by Architect.
- G. Any discrepancies which occur due to misgrading or to disturbance or erosion shall be regraded and re-rolled to the satisfaction of the Architect.

### 3.11 DISPOSAL OF EXCESS AND WASTE MATERIALS

- A. Removal to Designated Areas on Owner's Property: Transport acceptable excess excavated material to designated soil storage areas on Owner's property. Stockpile soil or spread as directed by Architect.
- B. Removal from Owner's Property: Remove waste materials, including unacceptable excavated material, trash, and debris, and legally dispose of it off Owner's property. The Contractor is responsible for obtaining a legal disposal site and necessary permits (as required) for disposal of excess earthwork materials and debris. The Contractor also agrees to hold the Owner harmless from all damages, fines, etc. arising out of improper disposal, if not otherwise provided by law.

### 3.12 CERTIFICATION

- A. Upon completion of this portion of the work, and as a condition of its acceptance, deliver to the Architect written reports from the soils engineer and the surveyor.
  - 1. The Geotechnical Testing Agency shall certify that the compaction requirements have been obtained. State in the report the area of fill or embankment, the compaction density obtained, and the type or classification of fill material placed.

2. The Surveyor shall certify that the layout, grades, slopes, and levels are in conformance with the drawings and specifications as outlined in this Section.

**END OF SECTION**

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## SECTION 321216 ASPHALT PAVING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes all labor, equipment, and materials necessary for the installation and testing of Warm Mix Asphalt Superpave Wearing Course, Warm Mix Asphalt Superpave Binder Course, and Warm Mix Asphalt Superpave Binder Course of specified depths.
- B. Section Includes:
  - 1. Asphalt paving base course, binder course, and wearing course.
- C. For bituminous asphalt paving in public right-of-way. Refer to the City of Philadelphia, Department of Streets, Standard Construction Items for materials, equipment, installation, and testing requirements.

#### 1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related Sections:
  - 1. Section 312000 - Earthwork

#### 1.3 REFERENCES

- A. The most current version of 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 only.
  - 1. Pennsylvania Department of Transportation (PennDOT), Publication 408/2020
  - 2. PennDOT Bulletin No. 15: Qualified Products List for Construction
  - 3. Asphalt Institute (AI): "The Asphalt Handbook"
  - 4. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):
    - a. ASTM D 692 - Coarse Aggregate for Bituminous Paving Mixtures
    - b. ASTM D 979 - Sampling Bituminous Paving Mixtures
    - c. ASTM D 1073 - Fine Aggregate for Asphalt Paving Mixtures
    - d. ASTM D 1188 - Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples
    - e. ASTM D 2041 - Theoretical Maximum Specific Gravity and Density of Asphalt Mixtures
    - g. ASTM D 2726 - Bulk Specific Gravity and Density of Non-Absorptive Compacted Asphalt Mixtures
    - h. ASTM D 2950 - Density of Bituminous Concrete in Place by Nuclear Methods

- i. ASTM D 3549 - Thickness or Height of Compacted Asphalt Mixture Specimens
  - j. ASTM D 3666 - Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
- B. The Contractor is required to have one copy of the latest edition of each of the following publications available for review in the job-site construction office at all times while performing the work described in this Section. The Contractor is to comply with each of the following unless more stringent requirements are indicated on the Drawings or within these specifications.
  - 1. City of Philadelphia, Department of Streets: Standard Construction Items, except that measurement and payment sections do not apply
  - 2. Publication 408: Specifications, except that measurement and payment sections do not apply.

#### 1.4 SUBMITTALS

- A. Product Data: For each product specified. Include technical data and tested physical and performance properties.
- B. Job-Mix Design: Certification, by PennDOT and other authorities having jurisdiction, of approval of each job mix proposed for the Work.
- C. Qualification Data: For firms and persons specified in the “Quality Assurance” Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Architects and Owners, and other information specified.
- D. Material Test Reports: Test Reports shall be from the approved testing agency. Indicate and interpret test results for compliance of materials with requirements indicated.
- E. Material Certificates: Certificates signed by manufacturers certifying that each material complies with the requirements.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed warm-mix asphalt paving similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Manufacturer Qualifications: Engage a firm experienced in manufacturing warm-mix asphalt similar to that indicated for this project and with a record of successful in-service performance.
  - 1. Firm shall be a registered and approved paving mix manufacturer listed in PennDOT Bulletin No. 15.
- C. Testing Agency Qualifications: Demonstrate to the Owner's satisfaction, based on Owner's evaluation of criteria conforming to ASTM D 3666, that the independent

testing agency has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.

- D. Obtain materials from the same source throughout the project.
- E. Pre-construction conference: Conduct conference at the project site to comply with the requirements of Division 1 sections and to review the methods and procedures related to asphalt paving including but not limited to the following:
  - 1. Review proposed sources of paving materials, including capabilities and location of plant that will manufacturer warm-mix asphalt.
  - 2. Review condition of substrate and preparatory work performed by other trades.
  - 3. Review requirements for protecting paving work, including restriction of traffic during installation period for remainder of construction period.
  - 4. Review and finalize construction schedule for paving and related work. Verify availability of materials, paving installer's personnel, and equipment required to execute the work without delays.
  - 5. Review inspection and testing requirements, governing regulations, and proposed installation procedures.
  - 6. Review forecasted weather conditions and procedures for coping with unfavorable conditions.

## 1.6 REGULATORY REQUIREMENTS

- A. Contractor shall obtain all necessary City of Philadelphia Streets Department road opening permits and approvals, and City of Philadelphia Department of Licenses and Inspections permits and approvals, upon the Contractor receiving Notice to Proceed and prior to proceeding with the Work.

## 1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if substrate is wet or excessively damp or if the following conditions are not met:
  - 1. Asphalt Base Course: Minimum air or surface temperature of 35 deg F at time of placement in accordance with PennDOT Publication 408, Section 313.3(b).
  - 2. Asphalt Wearing Course: Minimum air or surface temperature of 40 deg F at time of placement in accordance with PennDOT Publication 408, Section 413.3(b).

## PART 2 - PRODUCTS

### 2.1 AGGREGATES

- A. Aggregates shall be in accordance with the latest version of PennDOT Publication 408, Section 413.2(b). Provide aggregate from sources listed in PennDOT Bulletin 14.

### 2.2 ASPHALT MATERIALS



- A. Asphalt Cement: PG-64-22 emulsion in accordance with PennDOT Publication 408, Section 413.2(a)1.
  - 1. Water: Potable
  - 2. Mix designs shall contain a maximum of 15% reclaimed asphalt pavement.

### 2.3 AUXILIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by Environmental Protection Agency (EPA) and PADEP. Provide granular, liquid, or wettable powder form.
- B. Sand: Type B in accordance with PennDOT Publication 408, Section 703.
- C. Joint Sealant: ASTM D 3405 or AASHTO M 301, hot applied, single component, polymer-modified bituminous sealant.
- D. Geotextile: Class 4, Type A Non-Woven Needle Punched Geotextile Fabric in accordance with PennDOT Publication 408, Section 735.

### 2.4 MIXES

- 1. Warm-mix Asphalt: Provide dense, hot-laid, warm mix asphalt plant mixes approved by PennDOT and complying with the following requirements:
  - a. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
  - b. Superpave Base Course: Superpave Asphalt Mixture Design, WMA Base Course, PG 64-22, < 0.3 Million ESALs, 25 mm Mix, in accordance with PennDOT Publication 408, Section 313.
  - c. Superpave Binder Course: Superpave Asphalt Mixture Design, WMA Binder Course, PG 64-22, < 0.3 Million ESALs, 19 mm Mix, in accordance with PennDOT Publication 408, Section 413.
  - d. Superpave Wearing Course: Superpave Asphalt Mixture Design, WMA Wearing Course, PG 64-22, < 0.3 Million ESALs, 6.3 mm Mix, in accordance with PennDOT Publication 408, Section 413.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.
- B. Refer to Section 321116 for subbase preparation requirements. Refer to Section 321136 for Concrete Base Course Preparation.
- C. Verify gradients and elevations of subbase or base are correct.
- D. Asphalt paving courses shall be installed in accordance with PennDOT Publication 408, Section 413.
- E. Protect adjacent work and structures from splashing of paving materials.

### 3.2 CONDITIONING OF EXISTING SURFACE

- A. The vertical surface of curbs, structures, gutters, and existing paving in contact with bituminous mixtures, shall be painted with a uniform coating of bituminous material of the class and type designated for the surface course.

### 3.3 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subbase or base is ready to receive paving.
  - 1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted aggregate base before applying paving materials.
  - 1. Apply herbicide only if absolutely necessary. Owner approval in writing is required prior to any herbicide application. Herbicide application must comply with all federal, state and local regulations.
- C. Adjust elevation of existing utility structure tops to remain, including but not limited to manholes, inlet grates, valve boxes, etc. to final grades. Depending on the type of utility structure, adjustment shall be accomplished by the installation of factory-fabricated adjustment rings, installation of additional masonry courses under existing manhole castings or inlet tops, or resetting structures. Coordinate with utility owners prior to disturbing existing underground utilities to remain.
- D. At existing curbs to remain, mill existing pavement as required to maintain existing curb reveal unless otherwise noted on the Drawings.

### 3.4 DEMOLITION

- A. Saw cut and notch existing paving as indicated on Drawings.
- B. Clean existing paving to remove foreign material, excess joint sealant and crack filler from paving surface.
- C. Repair surface defects in existing paving to provide uniform surface to receive new paving.

### 3.5 WARM-MIX ASPHALT PLACING

- A. Machine place warm-mix asphalt mix on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and compacted thickness as indicated on the Drawings.

1. Place warm-mix asphalt base course in a single lift and thickness indicated on the Drawings or within these specifications.
  2. Place warm-mix asphalt binder course in a single lift and thickness indicated on the Drawings or within these specifications.
  3. Place warm-mix asphalt wearing surface course in single lift and thickness indicated on the Drawings or within these specifications.
  4. Spread mix at minimum temperature as indicated in PennDOT Publication 408, Section 413.
  5. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated on the Drawings or within these specifications.
- B. Place paving in consecutive strips not less than 10 feet wide, except where infill edge strips of a lesser width are required. After the first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete asphalt binder course for a section before placing asphalt wearing surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with warm-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

### 3.6 JOINTS

- A. Construct joints to ensure continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of warm-mix asphalt course.
1. Clean contact surfaces and apply tack coat.
  2. Offset longitudinal joints in successive courses a minimum of 6 inches, however, the joint at the top layer shall be at the centerline of the roadway for 2-lane roads, and at the lane lines for roads with more than two lanes.
  3. Offset transverse joints in successive courses a minimum of 24 inches.
  4. Construct transverse joints by bulkhead method or sawed vertical face method as described in AI's "The Asphalt Handbook".
  5. Compact joints as soon as warm-mix asphalt will bear roller weight without excessive displacement.
  6. Compact asphalt at joints to a density within 2 percent of specified course density.
- B. Apply bituminous material of the class and type designated for the surface course where new pavement meets existing bituminous pavement, and where bituminous pavement meets curbs and utility structures. Apply sealant in layer thickness that provides for curing and will not cause tracking or lifting of sealant to other surfaces. Apply a fine sand covering temporarily over sealant during curing period.

### 3.7 PAVEMENT COMPACTION

- A. When the subgrade is exposed proof roll according to the requirements shown. Densify to a stable subgrade. If the Owner determines that the subgrade cannot be densified to a

stable condition, then the Owner may direct the Contractor to remove additional subgrade material to the depth required for a stable condition. The Contractor shall then replace unstable subgrade material with 2A stone compacted in 6-inch loose lifts.

- B. Begin new pavement compaction as soon as placed warm-mix paving will bear roller weight without excessive displacement. Compact warm-mix paving with hot, hand tampers, or vibratory-plate compactors in areas inaccessible to rollers.
  - 1. Complete compaction before mix temperature cools to 185 F.
- C. Breakdown Rolling: Accomplish breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Repair surfaces by loosening displaced material, filling with warm-mix asphalt, and rerolling to required elevations.
- D. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling, while warm-mix asphalt is still hot enough to achieve specified density. Continue rolling until warm-mix asphalt course has been uniformly compacted to the following density:
  - 1. Density: not less than 95 percent of the density requirements established by the Marshall method at the time of approval of the mix design.
- E. Finish Rolling: Finish roll paved surfaces to remove roller marks while warm-mix asphalt is still warm.
- F. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method.
- G. Repairs: Remove newly paved areas that are defective or contaminated with foreign materials. Remove paving course over areas affected and replace with fresh, warm-mix asphalt. Compact by rolling to specified density and surface smoothness.
- H. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- I. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

### 3.8 INSTALLATION TOLERANCES

- A. Thickness: Compact each course to produce the thickness indicated on the Drawings within the following tolerances:
  - 1. Base Course: Plus or minus ¼ inch
  - 2. Binder Course: Plus or minus ¼ inch
  - 3. Wearing Surface Course: Plus ¼ inch, no minus.
- B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10 foot straightedge applied transversely or longitudinally to paved areas:

1. Base Course: ¼ inch.
2. Binder Course: ¼ inch
3. Wearing Surface Course: 1/8 inch.
4. Crowned Surfaces: Test with crowned template centered at right angle to crown. Maximum allowable variance from template is 0.25 inch.

### 3.9 FIELD QUALITY CONTROL

- A. Testing Agency: As part of this contract, the Contractor shall engage a qualified independent testing agency meeting the requirements of paragraph 1.06 to perform field inspections and test and to prepare test reports.
  1. Testing agency shall conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.
- B. Additional testing, at Contractor's sole expense, will be performed to determine compliance of corrected Work with specified requirements.
- C. Thickness: In-place compacted thickness of warm-mix asphalt courses will be determined according to ASTM D3549.
- D. Surface Smoothness: Finished surface of warm-mix asphalt will be tested for compliance with smoothness tolerances.
- E. In-Place Density: Samples of uncompacted paving mixtures and compacted pavement will be secured by the testing agency according to ASTM D 979.
  1. Reference laboratory density shall be determined by averaging results from 4 samples of warm-mix asphalt-paving mixture delivered daily to site and compacted according to job-mix specifications.
  2. Reference maximum theoretical density shall be determined by averaging results from 4 samples of warm-mix asphalt paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
  3. In-place density of compacted pavement shall be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
  4. One core sample shall be taken for every 1000 sq. yd. or less of installed pavement, but no case will fewer than 3 cores be taken.
    - a. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
    - b. The Contractor shall fill all holes from which cores were taken. Restore and seal the surface to conditions similar to the adjacent areas.
- F. Remove and replace or install additional warm-mix asphalt, at the Contractor's sole expense, where test results or measurements indicate that it does not comply with specified requirements.

### 3.10 CLEANUP

- A. Remove bituminous material from utility structure frames and covers. Open and reset utility manhole covers and inlet grates to ensure castings are not sealed shut.

- B. Clean up debris and unused material, and remove from the site. Dispose of all material in accordance with local, state, and federal regulations. Do not dump material in manholes or inlets.

- END -

## SECTION 321313 - CONCRETE PAVING

### 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. Concrete Paving for walkways.
  - 2. Curbs.

#### 1.3 RELATED SECTIONS

- A. Section 312000 – Earth Moving

#### 1.4 REFERENCES

- A. American Society for Testing and Materials (ASTM) Standards as listed in Specification.
- B. American Concrete Institute (ACI) Standards as listed in Specification.
- C. PennDOT Publication 408 Construction Specifications (current edition).
- D. PennDOT Publication 72 Standards for Roadway Construction (current edition).

#### 1.5 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

#### 1.6 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Ziehler Playground, 200-64 E. Olney Avenue, Philadelphia, PA 19120.

## 1.7 ACTION SUBMITTALS

- A. Product Data: For each type of product, furnish samples, manufacturer's product data, test reports, and materials certifications as required in referenced sections for concrete and joint fillers and sealers.
- B. Samples for Verification: For each type of product or exposed finish, prepared as Samples of size indicated below:
- C. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
  - 1. Mix designs and the name of the Contractor's technician shall be submitted to the Landscape Architect for approval prior to the start of the Work. Concrete shall not be placed until approval is received.
- D. Placement Schedule

## 1.8 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For the following, from manufacturer:
  - 1. Cementitious materials.
  - 2. Admixtures.
  - 3. Curing compounds.
  - 4. Applied finish materials.
  - 5. Bonding agent or epoxy adhesive.
  - 6. Joint fillers.
- B. Material Test Reports: For each of the following:
  - 1. Aggregates
- C. Field quality-control reports.

## 1.9 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
  - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").
- B. Testing Agency Qualifications: Qualified according to ASTM C1077 and ASTM E329 for testing indicated.
  - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- C. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents.



1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
  2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
  3. ACI 303.1, "Specification for Cast-in-Place Architectural Concrete."
- D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockups of full-thickness sections of standard and exposed aggregate concrete paving to demonstrate typical joints; surface finish, texture, and color; curing; and standard of workmanship.
  2. Build mockups of concrete paving (min. 6'x6') for review and approval by Landscape Architect.
  3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Landscape Architect specifically approves such deviations in writing.
  4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Notify Landscape Architect after completion of Field Sample Panels. At direction of Landscape Architect, additional samples may be required if field panels do not meet required color, consistency, formwork and finish specified.

#### 1.10 PRECONSTRUCTION TESTING

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

#### 1.11 FIELD CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
  2. Do not use frozen materials or materials containing ice or snow.
  3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.
- C. Hot-Weather Concrete Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.

## PART 2 - PRODUCTS

### 2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 unless otherwise indicated.

### 2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces. Furnish in largest practicable sizes to minimize number of joints.
  - 1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms
  - 2. Use forms that will not discolor the concrete.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.
- C. Form Ties: Factory-fabricated, removable ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

### 2.3 CONCRETE MATERIALS

- A. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:
  - 1. Comply with requirements of PennDOT Publication 408, Section 704 for concrete materials, admixtures, bonding materials, curing materials, and others for Class A Concrete.
- B. Air-Entraining Admixture: ASTM C260/C260M.
- C. Water: Potable and complying with ASTM C94/C94M.
- D. Liquid Membrane Forming Curing Compound: Complying with ASTM C309, Type I, Class A. Moisture content loss not more than 0.055 gr./sq. cm when applied at 200 sq. ft./gal.
- E. Bonding Compound: Polyvinyl acetate or acrylic base, rewettable type.
- F. Epoxy Adhesive: ASTM C881, two component material suitable for use on dry or damp surfaces.
- G. Aggregate base for Sidewalks: PennDOT No. 2A modified.

### 2.4 RELATED MATERIALS

- A. Joint Fillers: ASTM D1751, asphalt-saturated cellulosic fiber in preformed strips, of ASTM D8939 preformed polypropylene foam.

- B. Joint Sealant: Silicone joint sealer per PennDOT Publication 408, Section 705.4 (a).
- C. Joint Backing Material: Expanded, low-density polyethylene foam.

## 2.5 CONCRETE MIXTURES

- A. Prepare design mixtures according to PennDOT Publication 408, Section 704 sections for concrete mix design, sampling and testing, and quality control, and as specified.
- B. Design mix to produce Class “AA” or “A” concrete meeting the requirements of PennDOT Publication 408, Section 704.
  - 1. Minimum strength: 4,000 psi at 28 days.
  - 2. Concrete shall contain either a water-reducing, plasticizing admixture or a high-range water reducing admixture.
  - 3. All concrete shall contain an air-entraining admixture to provide 5%-7% air entrainment.
  - 4. Maximum chloride content shall be 0.15%.
  - 5. Maximum water/cement ratio shall be 0.45.
  - 6. Maximum design slump of 3 inches without super plasticizers.
  - 7. Aggregate shall be ¾” with a designation of 4S per ASTM C33.
  - 8. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
  - 9. Confirm concrete mixtures with Landscape Architect.

## 2.6 CONCRETE MIXING

- A. Measure, batch, and mix concrete materials and concrete according to PennDOT Publication 408, Section 704.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Preparation of subgrade shall be in accordance with PennDOT Publication 408, Section 210.2. If soft areas are encountered, the Landscape Architect may direct the Contractor to allow sufficient time for the subgrade to dry out. If the area cannot be suitable compacted, the Landscape Architect can order it to be removed and backfilled with suitable material.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.

### 3.3 CONCRETE SIDEWALK

- A. Construction shall meet the requirements of PennDOT Publication 408, Section 676.3, except that the aggregate bed shall 4 inches and expansion joint shall be 1/2-inch unless otherwise indicated on Drawings.

### 3.4 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete formwork installation, steel reinforcement and items to be embedded or cast-in. Check subbase and forms for line and grade.
- B. Remove snow, ice, or frost from subbase surface before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery or at Project site unless approved by Landscape Architect. Do not add water to fresh concrete after testing.
- F. Place concrete using methods that prevent segregation of mix. Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than 1 hour, place a construction joint. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
  - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating joint devices.
- H. Screed paving surface with a straightedge and strike off.
- I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- J. Curbs and Gutters: Produce curbs and gutters to required cross section, lines, grades, finish, and jointing per Drawings and Details.

### 3.5 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.

- B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
  - 1. Medium to Fine Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.

### 3.6 CONCRETE CURB

- A. Construction shall meet the requirements of PennDOT Publication 408, Section 630.3, with the following additions:
  - 1. Concrete may be placed in the forms in one lift provided there are sufficient workers and equipment on the project to thoroughly consolidate the concrete.
  - 2. Cure shall be applied to the top of the curb before any marked dehydration of the concrete surface occurs. The forms shall be removed within 24 hours and all exposed concrete surfaces cured.
  - 3. When directed, the Contractor shall provide additional protection by covering the curb with salt hay at Contractor's expense.
  - 4. All curbs shall be set to lines and grades by Surveyor.

### 3.7 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
  - 1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
  - 1. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Expansion Joints: Form expansion joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
  - 1. Locate expansion joints at intervals of 30 feet unless otherwise indicated.
  - 2. Extend joint fillers full width and depth of joint.
  - 3. Terminate joint filler not less than 1/2-inch or more than 1-inch below finished surface if joint sealant is indicated.
  - 4. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
  - 5. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

- D. Control Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
  - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

### 3.8 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection and ACI301 for hot weather protection during curing.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Moist cure all concrete work and commence moist curing as soon as finishes will not be marred. Insulating blankets, waterproofed kraft paper, or polyethylene film as per ASTM C171 shall be used to keep the concrete continuously moist during the curing process.

### 3.9 PAVING TOLERANCES

- A. Comply with tolerances in PennDOT Publication 408 unless otherwise specified below:
  - 1. Elevation: 1/2-inch.
  - 2. Surface: Gap below 10-foot long; unlevelled straightedge not to exceed 1/8-inch in longitudinal direction and 1/4-inch in transverse direction.
  - 3. Joint Spacing: 3-inches.
  - 4. Contraction Joint Depth: Plus 1/4-inch, no minus.
  - 5. Joint Width: Plus 1/8-inch, no minus.

### 3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to PennDOT PTM 601 shall be performed according to the following requirements:

1. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  2. Slump: Shall be take in accordance with PennDOT PTM 600.
  3. Air Content: First and second air content tests shall be in accordance with PennDOT PTM 612, PTM 613, or PTM 615. If the air content is within specifications, the Contractor may elect to use PTM 602 for the remaining tests, however the Landscape Architect can require the Contractor to return to the original method if in the opinion of the Landscape Architect it is warranted.
  4. Concrete Temperature: ASTM C1064/C1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
  5. Compression Test Specimens: Test specimens shall be molded and cured in accordance with PennDOT PTM 611.
  6. Compressive-Strength Tests: ASTM C39/C39M; test one specimen at seven days and two specimens at 28 days.
    - a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- D. Test results shall be reported in writing to Landscape Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Landscape Architect.
- F. Concrete paving will be considered defective if it does not pass tests and inspections.
- G. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- H. Prepare test and inspection reports.
- 3.11 REPAIR AND PROTECTION
- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Landscape Architect.

- B. Drill test cores, where directed by Landscape Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313



## SECTION 321613 – SITE CAST-IN-PLACE CONCRETE

### 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 SCOPE OF WORK

- A. This Section includes the following applications for site concrete:
  1. Concrete Pads
  2. Concrete Foundations
  3. Concrete Retaining Wall

#### 1.3 REFERENCES

- A. The most current version of 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 only.
- B. Commonwealth of Pennsylvania, Department of Transportation, Specifications, Publication 408, (PennDOT 408), except that measurement and payment sections do not apply
- C. American Concrete Institute (ACI)
  1. ACI 301: Specification for Structural Concrete
  2. ACI 347: Guide to Formwork for Concrete
  3. ACI 304R: Guide for Measuring, Mixing, Transporting and Placing Concrete
  4. Guide for Consolidation of Concrete
  5. ACI 306.1: Standard Specification for Cold Weather Concreting
  6. ACI 311.4R: Guide for Concrete Inspection
  7. ACI 311.5R: Batch Plant Inspection and Field Testing of Ready-Mixed Concrete
  8. ACI 350R: Code Requirements for Environmental Engineering Concrete Structures
  9. ACI SP 66: ACI Detailing Manual
- D. American Society for Testing and Materials (ASTM)
  1. ASTM A 185: Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
  2. ASTM A 615: Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
  3. ASTM C 31: Standard Practice for Making and Curing Concrete Test Specimens in the Field
  4. ASTM C 33: Standard Specification for Concrete Aggregates
  5. ASTM C 39: Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

6. ASTM C 42: Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
  7. ASTM C 94: Standard Specification for Ready-Mixed Concrete
  8. ASTM C 143: Standard Test Method for Slump of Hydraulic Cement Concrete
  9. ASTM C 150: Standard Specification for Portland Cement
  10. ASTM C 171: Standard Specification for Sheet Materials for Curing Concrete
  11. ASTM C 172: Standard Practice for Sampling Freshly Mixed Concrete
  12. ASTM C 231: Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
  13. ASTM C 260: Standard Specification for Air-Entraining Admixtures for Concrete
  14. ASTM C 309: Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
  15. ASTM C 494: Standard Specification for Chemical Admixtures for Concrete
  16. ASTM C 618: Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
  17. ASTM C 1064: Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete
  18. ASTM D 1751: Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
  19. ASTM D 1752: Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
- E. The Contractor is required to have one copy of the latest edition of each of the following publications available for review in the job-site construction office at all times while performing the work described in this Section. The Contractor is to comply with each of the following unless more stringent requirements are indicated on the Drawings or within these specifications.
1. City of Philadelphia Department of Streets - Standard Construction Items, except that measurement and payment sections do not apply
  2. ACI 301: Specification for Structural Concrete

#### 1.4 SUBMITTALS

- A. General: Submit each item in accordance with the General Requirements and Conditions of the Contract documents.
- B. Product Data: For each type of manufactured material and product indicated.
- C. Design Mixes: For each concrete pavement mix and class. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
- D. Joint Layout: Submit a sketch showing the location of all expansion and control joints and scoring prior to placing concrete. Indicate method of installing score lines.
- E. Shop Drawings: For concrete reinforcement, including dowels, wire fabric, bar layout, and all other reinforcement. Shop drawings shall be in accordance with the ACI SP66, and detailed at scales to clearly show the layout of all new reinforcing steel.
- F. Laboratory test reports: From a testing laboratory meeting the requirements of paragraph 1.05.C below, indicating and interpreting test results for compliance with the requirements indicated

within these specifications and based on comprehensive testing of current materials and mix designs.

- G. Material Certificates: Signed by manufacturers and the Contractor certifying that each of the following materials complies with or exceeds requirements:
  - 1. Cementitious materials and aggregates.
  - 2. Admixtures.
  - 3. Curing compounds.
  - 4. Applied finish materials.
  - 5. Bonding agent or adhesive.
  - 6. Joint fillers and sealers.
  - 7. Forming accessories.
  - 8. Steel reinforcement.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed pavement work similar in material, design, and extent to that required for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Concrete Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
  - 1. Manufacturer must be certified according to the National Ready Mix Concrete Association's Plant Certification Program.
- C. Testing Agency Qualifications: "Testing Agency Qualifications": An independent testing agency conforming to the requirements of the American Concrete Institute Publications ACI 311.4R and ACI 311.5R (latest editions), and also acceptable to the project team
- D. Source Limitations: Obtain each type of class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.
- E. ACI Publications: Comply with ACI 301, unless modified by the requirements of the Contract Documents.
- F. Concrete Testing Service: Engage a qualified independent testing laboratory to perform material evaluation tests and to design concrete mixes.

## 1.6 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans.

## 1.7 REGULATORY REQUIREMENTS

- A. Traffic Control: Maintain access of and protection for vehicular and pedestrian traffic as required for construction activities in accordance with local regulations.

## PART 2 - PRODUCTS

### 2.1 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces. Use flexible or curved forms for curves of a radius 100 feet or less.
- B. Form Release Agent: Provide commercially formulated form-release agent with a maximum of 350 g/l volatile organic compound (VOCS) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

### 2.2 CONCRETE MATERIALS

- A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.
- B. Portland Cement: ASTM C 150, type IA.
- C. Fly Ash: ASTM C 618, Class C or F including supplementary optional requirements relating to reactive aggregates and alkalis, and loss on ignition (LOI) not to exceed 5 percent.
- D. Normal-Weight Aggregates: ASTM C 33, class 4, uniformly graded, from a single source, with coarse aggregate as follows:
  - 1. Size 67.
  - 2. Maximum size of coarse aggregates not more than one-fifth of narrowest dimension between sides of forms, one-third of depth of slabs, nor three-fourth of minimum clear spacing between reinforcing bars.
  - 3. Do not use fine or coarse aggregate containing substances that cause spalling.
- E. Fine Aggregate: ASTM C33. Fine aggregate for applied concrete floor topping shall pass a No. 4 sieve, 10 percent maximum shall pass a No. 100 sieve.
- F. Water: Potable, ASTM C 94.

### 2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

### 2.4 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain no more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures. Use only one manufacturer as a source for all admixtures. Contractor is responsible for verifying that any and all admixtures, when used in combination, are compatible with any other admixture used in mix design. Verification to be provided with mix design and product data submittals, for review by the Owner.

- B. Air-Entraining Admixtures: ASTM C 260, certified by manufacturer to be compatible with other required admixtures and not containing more chloride ions than are present in municipal drinking water.
- C. Water-Reducing Admixture: ASTM C 494, Type A, certified by manufacturer to be compatible with other required admixtures and not containing more chloride ions than are present in municipal drinking water.
- D. High-Range Water-Reducing Admixture: ASTM C 494, Type F or G, and not containing more chloride ions than are present in municipal drinking water.
- E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
- G. Prohibited Admixtures: Calcium chloride, thiocyanate or admixtures containing more than 0.05 percent chloride ions are not permitted.

## 2.5 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq.yd. dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular film-forming compound, manufactured for application to fresh concrete for temporary protection from rapid moisture loss.
- E. Clear or white Liquid-Membrane-Forming Curing Compound: PENNDOT 408 Section 711.2

## 2.6 CONCRETE PROTECTION MATERIALS

- A. Concrete protection materials shall be a linseed oil mixture of equal parts, by volume, of linseed oil and either mineral spirits, naphtha, or turpentine. At the option of the Contractor, commercially prepared linseed oil mixtures, formulated specifically for application to concrete to provide protection against the action of deicing chemicals may be used, except that emulsified mixtures are not acceptable.

## 2.7 RELATED MATERIALS

- A. Expansion-and-Isolation-Joint-filler-Strips: PENNDOT 408, Section 705.1, Type (b) filler
- B. Joint Sealer: In accordance with PennDOT 408, Section 705.4.
- C. Graphite Lubricant: In accordance with PennDOT 408, Section 705.6.

## 2.8 CONCRETE MIXES

- A. Prepare design mixes, proportioned according to PENNDOT 408, for each type and strength of concrete.
- B. Use an independent testing agency meeting the requirements of paragraph 1.5.C for preparing and reporting proposed mix designs for the trial batch method.
- C. Proportion mixes to provide concrete with the compressive strength as indicated on Drawings.
- D. Maximum Water-Cementitious Materials Ratio: at point of placement, 0.45.
- E. Slump Limit: 3 inches, in accordance with ASTM C143.
  - 1. Slump Limit for concrete containing high-range-water admixture (superplasticizer): not more than 8 inches after adding admixture to plant-or-site verified, 2-to-3 inch slump concrete.

## 2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.
  - 1. When air temperature is between 85 degrees F and 90 degrees F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 degrees F, reduce mixing and delivery time to 60 minutes.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Compact subgrade as indicated in Section 321116. Proceed with pavement only after nonconforming conditions have been corrected and subgrade and base course are stable and ready to receive pavement. Subgrade shall be in a moist condition when concrete is placed.
- B. Remove loose material from compacted base course surface immediately before placing concrete.

### 3.2 FORMWORK, EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure formwork, including edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement. Form work shall be in accordance with ACI 347.
- B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

### 3.3 STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendation in CRSI's "Placing Reinforcing bars" for placing and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, dirt, ice or other bond reducing materials.
- C. Arrange, space, and securely tie bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

### 3.4 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318 or ACI 350R and as indicated on the Drawings.
- B. Inspection: Before placing concrete, inspect and complete formwork installation, and installation of all items to be embedded or cast in. Notify other trades so that they may install any embedded or cast in items required for their work prior to Contractor's inspection.
- C. Remove snow, ice, or frost from subbase or base course surface before placing concrete. Do not place concrete on surfaces that are frozen.
- D. Moisten base course to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- E. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.
- F. Do not add water to concrete during delivery, at Project, or during placement.
- G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- H. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.
  - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- I. 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 air temperature has fallen to or is expected to fall below 40 degrees F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F and not more than 80 degrees F at point of placement.
  - 2. Do not use frozen materials or materials containing ice or snow.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.
- J. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as specified when hot weather conditions exist.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 degrees F. 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. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
  3. Fog spray forms and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

### 3.5 JOINTS

- A. General: Construct construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated on the Drawings.
1. When joining existing pavement, place transverse joints to align with previously placed joints, unless indicated otherwise on the Drawings.
- B. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, manholes, inlets, structures, sidewalks, other fixed objects, and where otherwise indicated on the Drawings.
1. Locate expansion joints at maximum intervals of 30 feet, unless shorter intervals are otherwise indicated on the Drawings.
  2. Extend joint fillers full width and depth of joint.
  3. Terminate joint filler not less than ½ inch or more than 1 inch below finished surface if joint sealant is indicated to be used above joint filler.
  4. Place top of joint filler flush with finished concrete surface if joint sealant is not to be used.
  5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
  6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
  7. Install joint sealer in accordance with Manufacturer's instructions.
- C. Transverse Control Joints: Form weakened-plane transverse control joints, sectioning concrete into areas as indicated on the Drawings. Where sectioning is not indicated on the Drawings, space joints as described within this Section. Construct transverse control joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
- D. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to a 3/8-inch radius unless shown otherwise on the Drawings. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.



- E. Edging: Tool edges of pavement, curbs, and joints formed in concrete after initial floating with an edging tool to a 3/8-inch radius unless shown otherwise on the drawings. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.
- F. Sealant: Provide joint sealant at all isolation joints in accordance with sealant manufacturer's written instructions.

### 3.6 CONCRETE FINISHING

- A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.
- B. Comply with ACI-302-1R, regarding slab construction, regarding overworking of slab surfaces during finishing operations; in such cases where the air entrainment exceeds 3%.
- C. Float Finish: Begin the second floating operation when bleed water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Re-float surface immediately to a uniform granular texture.
- D. Surface Texture: Before the surface sheen has disappeared and before the concrete hardens, the surface of the pavement shall be given a texture as described herein. After curing is complete, all textured surfaces shall be thoroughly power broomed to remove all debris. Any type of transverse texturing shall produce grooves in straight lines across each lane within a tolerance of plus or minus 1/2 inch of a true line.
  - 1. Produce a surface which is free from porous spots, irregularities, depressions, and small pockets or rough spots which may result from accidentally disturbing particles of coarse aggregate embedded near the surface.

### 3.7 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold and hot temperatures. Comply with the recommendations of ACI 306R for cold weather protection and follow recommendations in ACI 305R for hot weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy weather conditions cause moisture loss approaching 0.2 lb./sq. ft x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials.
    - a. Water.

- b. Continuous water-fog-spray.
- c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with a 12-inch lap over adjacent absorptive covers.
- d. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- e. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

### 3.8 TOLERANCES

- A. Formwork: ACI 117, except the elevation tolerance of formed surfaces before removal of shores is +0 inch and -3/4 inch.
- B. Cross-Sectional Dimension: ACI 117, except tolerance for thickness of slabs 12 inches or less is +3/4 inch and - 1/4 inch.
- C. Reinforcement Fabricating and Placing: ACI 117, except that fabrication tolerance for bar sizes Nos. 3, 4, and 5 (Tolerance Symbol 1 in Fig. 2.1(a), ACI, 117) used as column ties or stirrups is +0 inch and -1/2 inch where gross bar length is less than 12 feet, or +0 inch and -3/4 inch where gross bar length is 12 feet or more.

### 3.9 FIELD QUALITY CONTROL TESTING

- A. Testing Laboratory: As part of this contract the Contractor shall retain the services of an independent testing and inspection laboratory meeting the qualifications of paragraph 1.5.C to sample materials, perform tests and prepare and submit reports during concrete placement.
- B. Testing Services: Testing shall be performed according to the following requirements:
  - 1. Sampling Fresh Concrete: Representative samples of fresh concrete shall be obtained according to ASTM C 172, except modified for slump to comply with ASTM C 94.
  - 2. Slump: ASTM C 143: One test at point of placement for each concrete truck delivery. Slump testing is to be performed prior to concrete placement. Addition of water to the concrete mix is not permitted after slump test.
  - 3. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test, but not less than one test for each day's pour of each type of air-entrained concrete.
  - 4. Concrete temperature: ASTM C 1064; one test hourly when air temperature is 40 degrees F and below and when 80 degrees F and above, and one test for each set of compressive-strength specimens.
  - 5. Compression Test Specimens: ASTM C 31 one set of four standard cylinders for each compression-strength test, unless directed otherwise. Cylinders shall be molded and stored for laboratory-cured test specimens except when field-cured test specimens are required. Contractor shall provide an insulated storage box for concrete cylinders.
  - 6. Compression-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd., but less than 25 cu. yd., plus one for each additional 50 cu. yd.

One specimen shall be tested at 7 days and two specimens at 28 days; and one specimen shall be retained in reserve for later testing if required.

7. When frequency of testing will provide fewer than five compressive-strength tests for a given class of concrete, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  8. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive compressive-strength test results equal or exceed specified compressive-strength and no individual compressive-strength test result falls below specified compressive-strength by more than 500 psi.
  9. Thickness Evaluation: The anticipated thickness of the concrete shall be determined prior to placement by passing a template through the formed section.
- C. Test results shall be reported in writing to the Owner, concrete manufacturer, and Contractor, within 24 hours of testing. Reports of compressive-strength tests shall contain the concrete manufacturer and Contractor name, Project identification name and number, date of concrete placement, name of concrete testing laboratory, concrete type and class, location of concrete batch in pavement, design compressive-strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day and 28-day tests.
- D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by the Owner but shall not be used as the sole basis for approval or rejection.
- E. Additional Tests: Testing laboratory shall make additional tests of concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by the Owner. Testing laboratory may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.
- F. Appearance: Exposed surfaces of the finished work will be inspected by the Owner and any deficiencies in appearance will be identified. Areas which exhibit excessive cracking, discoloration, form marks, or tool marks or which are otherwise inconsistent with the overall appearances of the works shall be removed and replaced at the Contractor's sole expense.

### 3.10 REPAIRS AND PROTECTION

- A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet the requirements in this Section. Concrete sections shall be removed to the nearest regularly spaced joint.
- B. Drill test cores where directed by the Owner when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete free of stains, discoloration, dirt and other foreign material. Sweep concrete pavement not more than 2 days before date scheduled for Substantial Completion inspections.
- E. Repair Surface Defects in accordance with ACI 301.

END OF SECTION 321613

PROJECT NO. 16640E-01-02  
321613 - 12  
SITE CAST-IN-PLACE CONCRETE

**SECTION 321723  
PAVEMENT MARKINGS**

**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. Painted markings applied to asphalt paving.

**1.3 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Ziebler Playground, 200-64 E. Olney Avenue, Philadelphia, PA 19120.
  - 1. Review methods and procedures related to marking asphalt paving including, but not limited to:
    - a. Pavement aging period before application of pavements markings.
    - b. Review requirements for protecting pavement markings, including restriction of traffic during installation period.

**1.4 ACTION SUBMITTALS**

- A. Product Data: Include technical data and tested physical and performance properties.
- B. Shop Drawings:
  - 1. Indicate pavement markings, colors, and dimensions to adjacent work.
- C. Samples: For each exposed product and for each color and texture specified; on rigid backing, 8 inches square.

**1.5 QUALITY ASSURANCE**

- A. Manufacturer's Qualifications:

1. Manufacturer regularly engaged, for past five (5) years, in manufacture of asphalt surface color coating system.
- B. Applicator's Qualifications:
1. Applicator regularly engaged, for past three (3) years, in application of surface color coating systems.
  2. Employ persons trained for application of surface color coating systems.
  3. Applicator must be authorized installer of the surfacing brand used.

## 1.6 FIELD CONDITIONS

- A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 50 deg F during application or within 24 hours after application.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. SportMaster Sport Surfaces  
PO Box 2277  
Sandusky, OH 44870  
P: 800-395-7325  
www.sportmaster.net

### 2.2 PAVEMENT-MARKING PAINT

- A. Subject to compliance with requirements, basis of design product shall be:
1. Basis of Design for Crack Sealant: SportMaster "Crack Magic".
    - a. 100% acrylic emulsion elastomeric crack sealant.
    - b. Seals cracks up to ½" wide in asphalt pavement.
  2. Basis of Design for Crack Filler: SportMaster "Acrylic Crack Patch".
    - a. 100% acrylic emulsion trowel-grade crack filler.
    - b. Fills cracks in asphalt pavement up to 1 inch wide.
  3. Basis of Design Product for Basketball Court Line Markings Primer: SportMaster "Stripe-Rite".
    - a. 100% acrylic emulsion primer, clear drying.
    - b. Primes line markings and prevents bleed-under for sharp lines.
  4. Basis of Design Product for Basketball Court Line Paint: SportMaster "Textured Line Paint".
    - a. Pigmented, 100% acrylic emulsion line paint.
    - b. Line marking on asphalt pavement.
    - c. Color: White.

5. Basis of Design Product for Basketball Court Painting:
  - a. Filler Course: SportMaster “Acrylic Resurfacer”
    - 1) 100% acrylic emulsion resurfacer.
    - 2) Mix on site with silica sand.
    - 3) Apply to asphalt surfaces in preparation of color coating system.
  - b. Color Coating: SportMaster “ColorPlus System”
    - 1) 100% acrylic emulsion coating.
    - 2) Mix on site with silica sand and water
      - a) Color 1: Yellow
      - b) Color 2: Dove Gray
      - c) Color 3: Tournament Purple

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that pavement-marking substrate is dry and in suitable condition to begin pavement marking in accordance with manufacturer's written instructions.
- B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

### 3.2 SURFACE PREPARATION

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Landscape Architect.
- B. Protect adjacent surfaces and landscaping from contact with court surface color system.
- C. Prepare surfaces in accordance with manufacturer's instructions.
- D. Cure new asphalt a minimum of 30 days before application.
- E. Remove dirt, dust, debris, oil, grease, vegetation, loose materials, and other surface contaminants that could adversely affect application of color coating system.
- F. Level depressions 1/8” and deeper with patch binder in accordance with manufacturer's instructions.
- G. Apply 2 coats of filler course as required by surface roughness and porosity to provide smooth underlayment for application of color coating.
- H. Ensure surface repairs are flush and smooth on adjoining surfaces.

### 3.3 APPLICATION

- A. Apply asphalt surface color coating system in accordance with manufacturer's instructions at locations indicated on the Drawings.

- B. Mix materials in accordance with manufacturer's instructions.
- C. Apply Filler Course and Color Coating with a 50-60 durometer, soft rubber squeegee.
- D. Filler Course:
  - 1. Apply 2 coats on new asphalt surfaces.
  - 2. Do not apply Filler Course to existing asphalt pavement. Utilize "Crack Magic" or "Acrylic Crack Patch" to fill cracks in existing asphalt pavement.
- E. Color Coating Apply 2 coats of color collating to prepared surfaces in accordance with manufacturer's instructions.
- F. Allow material drying times in accordance with manufacturer's instructions before applying other materials or opening completed surface to foot traffic.

### 3.4 LINE MARKINGS

- A. Lay out court line markings in accordance with Official High School rules for basketball.
- B. Apply line markings primer, after masking tape has been laid, to seal voids between masking tape and court surface to prevent bleed-under when line paint is applied.
- C. Apply a minimum of 1 coat of line paint in accordance with manufacturer's instructions.

### 3.5 PROTECTING AND CLEANING

- A. Allow a minimum of 24 hours curing time before opening courts for play.
- B. Protect pavement markings from damage and wear during remainder of construction period.
- C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 321723



**SECTION 321816.13**  
**PLAYGROUND PROTECTIVE SURFACING**

**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. Unitary, seamless surfacing.

**1.3 REFERENCES**

- A. American Society for Testing and Materials (ASTM):
  - 1. ASTM F1292 (Latest Edition) – Standard Specification for Impact Attenuation of Surfacing Materials within the Use Zone of Playground Equipment.
  - 2. ASTM F2223 (Latest Edition) – Standard Guide for ASTM Standards on Playground Surfacing.
  - 3. ASTM F1951 (Latest Edition) – Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment.
- B. Americans with Disabilities Act (ADA)
  - 1. Americans with Disabilities Act Accessibility Guidelines (Latest Edition).
- C. American National Standards Institute (ANSI)
- D. International Play Equipment Manufacturers Association (IPEMA)

**1.4 DEFINITIONS**

- A. Definitions in ASTM F2223 apply to Work of this Section.
- B. Critical Height: Standard measure of shock attenuation according to ASTM F2223; same as "critical fall height" in ASTM F1292. According to ASTM F1292, this approximates "the maximum fall height from which a life-threatening head injury would not be expected to occur."
- C. SBR: Styrene-butadiene rubber.
- D. Unitary Surfacing: A protective surfacing of one or more material components bound together to form a continuous surface; same as "unitary system" in ASTM F2223.

## 1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Ziehler Playground, 200-64 E. Olney Avenue, Philadelphia, PA 19120.

## 1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Submittal shall include, but is not limited to, all specifications, manufacturer's name and product code for all materials (Cushion Layer, Binders, and Wear Course), MSDS for all products, details, testing data, and installation instructions for all products used.
- B. Shop Drawings: For each type of protective surfacing.
  - 1. Include plans, sections, placement and penetration details, and attachment to substrates.
  - 2. Include accessories and edge terminations.
  - 3. Include patterns and colors as shown on the Drawings.
  - 4. Include fall heights and use zones for equipment and structures specified and coordinated with the critical heights for protective surfacing.
- C. Samples for Color Selection: Provide Color Samples from manufacturer for review and approval by Landscape Architect.
  - 1. Provide, at a minimum, 6-inch by 6-inch square or round samples of requested Color combinations for Color 1, Color 2 and Color 3 to Landscape Architect for color selection. Colors shall be mixture of at least two (2) but not more than three (3) chip colors, including 20% -30% black colored chips.
    - a. Color 1: Yellow Blend (50% Yellow, 30% Pearl, 20% Black)
    - b. Color 2: Light Gray Blend (75% Light Gray, 25% Black)
    - c. Color 3: Purple Blend (50% Purple, 30% Light Gray, 20% Black)
  - 2. Landscape Architect may request additional samples of blends for review prior to approving colors.

## 1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of unitary surfacing product.
  - 1. Product Liability Insurance Certificate.
  - 2. IPEMA Certification.
- C. Field quality-control reports.
- D. Sample Warranty: For manufacturer's special warranty.

## 1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For playground protective surfacing to include in maintenance manuals.

## 1.9 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer. The installer must have installed a minimum of ten (10) applications.
- B. Manufacturer Qualifications: Manufacturer must be in business for a minimum of five (5) years.
  - 1. Surface must be IPEMA certified.
  - 2. Safety surface shall maintain required impact attenuation characteristics and be guaranteed against defects in workmanship and material.
- C. Approved Samples for Color 1, Color 2 and Color 3 shall be used as Quality Mock-Up for comparison with finished installation.
  - 1. Finished Installation shall match Approved Samples.
- D. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for materials and execution.
  - 1. Approved Samples for unitary, seamless protective surfacing shall be used as Quality Mock-Up for comparison with finished installation.
  - 2. Build mockups for protective surfacing including accessories. Mockups shall include all colors to be installed as part of project.
    - a. Size: Minimum 6 feet by 6 feet, or larger to indicate pattern sufficient for review.
  - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Landscape Architect specifically approves such deviations in writing.
  - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Contractor/applicator shall provide a minimum of one Fall Height Test per ASTM F1292 from highest accessible point of each piece of play equipment being installed. See Part 3 Field Quality Control for additional testing information.

## 1.10 WARRANTY

- A. Special Warranty: Manufacturer and Installer agree to repair or replace components of protective surfacing that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Reduction in impact attenuation as measured by reduction of critical fall height.
    - b. Deterioration of protective surfacing and other materials beyond normal weathering.
  - 2. Warranty Period: Five (5) years from date of Substantial Completion.

### 1.11 DELIVERY, STORAGE, AND HANDLING

- A. Materials must be delivered in good condition, in original unopened packages with labels intact.
- B. Store all materials protected from weather and at temperatures not less than 32 degrees F for any twelve (12) hour duration.

### 1.12 SEQUENCING AND SCHEDULING

- A. Surfacing must be installed after all playground equipment and other structural elements, such as shade structures, signs and barriers, are installed.

### 1.13 JOB CONDITIONS

- A. Ambient air temperatures shall be 45 degrees F or greater and rising at the time of installation of the surface and shall remain at 33 degrees F Ambient air temperatures shall be 45 degrees F or greater and rising at the time of installation of the surface and shall remain at 40 degrees F or greater for at least 24 hours after application.0
- B. Adjacent materials and the surface shall be protected during installation, while curing and unattended, from weather and other damage.
- C. Surfacing shall be installed on a dry sub-surface, with no prospect of rain within the initial drying period and within the recommended temperature range of the manufacturer.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain protective surfacing materials from single source and from single manufacturer.
  - 1. Provide geosynthetic accessories of each type of source recommended by manufacturer of protective surfacing materials.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Impact Attenuation: Critical fall height tested according to ASTM F1292 for equipment as specified in the Drawings.
- B. Accessibility Standard: Minimum surfacing performance according to ASTM F1951.

2.3 UNITARY, DUAL-DENSITY, SEAMLESS SURFACING (Poured-in-Place (PIP) Rubber Safety Surface)

- A. Description: Manufacturer's standard, site-mixed and applied, two-layer material with wearing layer over cushioning layer, with combined, overall thickness as required, tested for impact attenuation according to ASTM F1292 and for accessibility according to ASTM F1951.
1. Manufacturers: Subject to compliance with requirements, available manufacturer's offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. DuraPlay, Inc.  
150 Brownson Lane, Driftwood, TX 78619  
Phone: 512-847-2473  
[www.duraplay.com](http://www.duraplay.com)
    - b. Surface America, Inc.  
P.O. Box 157, Williamsville, NY 14231  
Phone: 800-999-0555  
[www.surfaceamerica.com](http://www.surfaceamerica.com)
      - 1) Local Representative:  
Recreation Resource USA, LLC  
503 N. Walnut Road, #200, Kennett Square, PA 19348  
Phone: 610-444-4402  
[www.recreation-resource.com](http://www.recreation-resource.com)
    - c. Safety Turf, Inc.  
201 N. 4<sup>th</sup> Avenue, Royersford, PA 19468  
Phone: 800-804-4595  
[www.safetyturf.com](http://www.safetyturf.com)
  2. Wearing Layer: Formulation of EPDM rubber particles, binder, and other organic and inorganic components or Thermoplastic Vulcanizate (TPV).
    - a. A manufactured rubber having density of 1mm to 4mm.
    - b. Colors: as indicated on Drawings and approved by Landscape Architect based on samples provided by the Contractor.
    - c. Design: where colored pattern is required, provide as indicated on Drawings.
    - d. Wearing Layer thickness: minimum 1/2-inch under all areas of playground, except for the following:
      - 1) Under swing zone for swing sets and landing areas for slides: minimum 3/4-inch
  3. Cushioning Layer: Formulation of recycled black SBR particles and binder.
    - a. Shall be cryogenically processed.
    - b. Shall be 3/8-inch shredded mesh or 6/20 mesh and contain less than 4% dust.
    - c. Shall be packed in suitable bags to protect SBR from moisture.
    - d. Cushioning Layer thickness: 1-inch to 4-3/4-inches, depending on critical fall height of playground and fitness equipment (see Drawings) and per requirements of ASTM F1292.

4. Binder: Elastic polyurethane pre-polymer, MDI based, low odor, capable of excellent weathering and binding characteristics. Binder shall contain no TDI Monomers.
5. Critical Height: As indicated on Drawings based on requirements of playground equipment manufacturer.
6. Primer: A single-component moisture cured polyurethane primer.

B. Technical Information:

1. Applicable Standards:
  - a. Shock attenuation under ASTM F1292:
    - 1) GMAX less than 200.
    - 2) Head Injury Criteria: less than 1,000.
  - b. Non-slip characteristics under ASTM E303.
  - c. IPEMA Certified.
  - d. Flammability under 8S-5696 and ASTM D2859.
  - e. Tensile strength (ASTM D412): 60 psi.
  - f. Tear resistance (ASTM D624): 40% Elongation at break point (140% original size.)

C. Chemical Properties:

1. Cushioning Layer: 85% SBR rubber buffings, 15% polyurethane binder.
2. Wearing Layer: 78% EPDM or TPV rubber granules, 22% polyurethane binder.

## 2.4 GEOSYNTHETIC ACCESSORIES

- A. Geotextile: Per manufacturer's written recommendations.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for subgrade elevations, slope, and drainage and for other conditions affecting performance of the Work.
1. Verify that substrates are sound and without high spots, ridges, holes, and depressions and sloped to drain as indicated on Drawings.
  2. Verify that appropriate elevation of subgrade has been established.
- B. Hard-Surface Substrates: Verify that substrates are satisfactory for unitary, protective surfacing installation and that substrate surfaces are uniformly sloped to drain within recommended tolerances according to protective surfacing manufacturer's written requirements for cross-section profile.
1. Verify that hard-surface substrates have cured and all curing compounds and other deleterious substances that might adversely affect adhesion have been removed. Surface shall be clean and dry.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Prepare substrates to receive surfacing products according to protective surfacing manufacturer's written instructions.

### 3.3 INSTALLATION OF GEOSYNTHETIC ACCESSORIES

- A. Install geosynthetic accessories before edging and according to playground surface system manufacturer's and geosynthetic manufacturer's written instructions and in a manner that cannot become a tripping hazard.
  - 1. Geotextile: Completely cover area beneath protective surfacing, overlapping geotextile sides and edges a minimum of 4 inches with manufacturer's standard treatment for seams.

### 3.4 INSTALLATION OF SEAMLESS SURFACING

- A. Mix and apply components of seamless surfacing according to manufacturer's written instructions to produce uniform, monolithic, and impact-attenuating protective surfacing of required overall thickness.
- B. Substrate Primer: Apply primer over prepared hard-surface substrate with a short nap roller at the rate of 300 square feet per gallon, or at manufacturer's standard spreading rate.
  - 1. If installing mounds, provide skim coat of concrete over compacted stone base. Prime entire concrete surface of mounds.
  - 2. Do not over saturate the substrate.
  - 3. Prime adjacent vertical barriers such as playground and fitness equipment support legs, curbs, or other edging that will contact the surfacing system.
  - 4. Do not apply primer over compacted stone substrate.
- C. Poured Cushioning Layer: Spread evenly over compacted stone or primed substrate to form a uniform layer applied at manufacturer's standard spreading rate in one continuous operation, with a minimum of cold joints.
  - 1. Apply mixed binder / SBR at desired thickness 1/8-inch higher than measuring bar.
  - 2. Using a steel pool trowel, even binder / SBR mixture. Be sure to continuously lubricate trowel with soapy water. Do not saturate surface with lubricant.
  - 3. As the mixture is leveled, apply a downward pressure onto the surface so that the mixture compacts tightly.
  - 4. Check surface to be level.
  - 5. Allow to dry for ten (10) to twelve (12) hours, or until no indentations can be made by foot traffic.
- D. Intercoat Primer: Over cured cushioning layer, apply primer at manufacturer's standard spreading rate.

- E. Wearing Layer: Spread over primed base course to form a uniform layer applied at manufacturer's standard spreading rate in one continuous operation and, except where color changes, with no cold joints. Finish surface to produce manufacturer's standard wearing-surface texture.
  - 1. Apply mixed binder / granule at nominal 1/2-inch thickness.
  - 2. Using a steel pool trowel, spread even rubber / granule mixture. Be sure to continuously lubricate trowel with soapy water.
  - 3. As the mixture is leveled, apply a downward pressure onto the surface so that the mixture compacts tightly.
  - 4. Check surface to be level.
  - 5. Design: Where colored pattern is specified, place colored design material as soon as previously placed material is sufficiently cured, using primer specified by manufacturer.
    - a. Cold joints must be cut and primed prior to installing a different color surface.
  - 6. Allow to cure for a minimum of twenty-four (24) to forty-eight (48) hours prior to usage. At the end of minimum curing period, verify that the top surface is sufficiently dry and firm to allow foot traffic and use without damage to the surface. **DO NOT ALLOW FOOT TRAFFICE OR USE OF THE SURFACE UNTIL IT IS SUFFICIENTLY CURED.**
- F. Edge Treatment: As indicated on Drawings. Fully adhere edges to substrate with full coverage of substrate. Maintain fully cushioned thickness required to comply with performance requirements.

### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests.
- B. Perform the following tests with the assistance of a factory-authorized service representative:
  - 1. Perform "Installed Surface Performance Test" according to ASTM F1292 for each protective surfacing type and thickness in each playground area.
  - 2. Perform installed-surface-performance tests at no less than one series of tests for each 1000 sq. ft. of each type and thickness of in-place protective surfacing or part thereof.
- C. Playground protective surfacing will be considered defective if it does not pass tests.
- D. Prepare test reports.

### 3.6 PROTECTION

- A. It is the responsibility of the Contractor to provide security to protect the surface from foot traffic or vandalism during the forty-eight (48) cure period.

END OF SECTION 321816.13



## SECTION 323113 - CHAIN LINK FENCES AND GATES

### 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. Chain-link fences.

#### 1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM) Standards as listed in Specification.

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Ziehler Playground, 200-64 E. Olney Avenue, Philadelphia, PA 19120.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product. Provide manufacturer's data showing installation and limitations in use.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
    - a. Fence and gate posts, rails, and fittings.
    - b. Chain-link fabric, reinforcements, and attachments.
- B. Shop Drawings: For each type of fence and gate assembly.
  - 1. Include plans, elevations, sections, details, and attachments to other work.
  - 2. Include accessories and hardware
- C. Certifications: Provide signed manufacturer's material certification that products are in compliance with current ASTM standards.
- D. Samples for Verification: For each type of component with factory-applied finish, prepared on Samples of size indicated below:
  - 1. Polymer-Coated Components: In 6-inch lengths for components and on full-sized units for accessories.
  - 2. Fence fabric: 12-inch by 12-inch sample of each type of fence fabric.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer, testing agency and factory-authorized service representative.
- B. Product Certificates: For each type of chain-link fence and gate.
- C. Product Test Reports: For framework strength according to ASTM F1043, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Field quality-control reports.
- E. Sample Warranty: For special warranty.

## 1.7 WARRANTY

- A. All work under this section shall be warranted against defects in materials and workmanship for not less than five (5) years from the date of Substantial Completion.

## 1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: For each type of product required for the Work of this section, provide products from one source with resources to provide chain link fences and gates of consistent quality in appearance and physical properties.
  - 1. Manufacturer shall specialize in manufacturing chain link fence products with a minimum five (5) years of experience in successfully producing chain link fencing fabrications equivalent to that indicated for Project.
- B. Installer Qualifications: Company with demonstrated successful experience installing similar projects and products in accordance with ASTM F567 and have at least five years demonstrated experience.
- C. Coordinate Work with Work of other sections. Verify dimensions and Work of other trades which adjoin materials of this section before installing items specified.
- D. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
  - 1. Include minimum 8-foot length of fence complying with requirements.
  - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.9 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle materials and products in strict compliance with manufacturer's written instructions and industry standards.
- B. Deliver materials to site in undamaged condition. Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Store products

indoors in manufacturer's original containers and packaging with labels clearly identifying product name and manufacturer.

- C. Materials shall be stored in such a manner to ensure proper protection against damage, weather, vandalism and theft. Store materials off the ground to provide protection against oxidation caused by ground contact.

#### 1.10 PROJECT CONDITIONS

- A. Field Measurements: Check actual locations of property lines, walls, curbs, ramps, sleeves, and other construction to which fence must fit or meet by actual field measurements before fabrications and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

### PART 2 - PRODUCTS

#### 2.1 CHAIN LINK FENCE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  1. Northeast Fence & Iron Works, Inc.  
8451 Hegerman Street  
Philadelphia, PA 19136  
[www.northeastfence.net](http://www.northeastfence.net)
  2. Master Halco.  
3010 Lyndon B Johnson Freeway, Suite 800  
Dallas, TX 75234  
[www.masterhalco.com](http://www.masterhalco.com)
  3. Stephens Pipe and Steel, LLC.  
300 Streibeigh Lane,  
Montoursville, PA 17754  
[www.spsfence.com](http://www.spsfence.com)
  4. Products from other qualified manufacturers having a minimum five (5) years' experience manufacturing chain link fencing may be accepted if approved by Landscape Architect in writing. Fencing submitted must meet specifications for design, size, gauge of metal parts and fabrication, and fence style and height.

#### 2.2 CHAIN-LINK FENCE FABRIC

- A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below:
  1. Fabric Height: As shown on Drawings.

2. Steel Wire for Fabric: 9 gauge (0.148 inch).
  - a. Mesh Size: 2 inches.
  - b. Polymer-Coated Fabric: ASTM F668, Class 2b over zinc -coated steel wire.
    - 1) Color: Black in accordance with ASTM F934.
3. Selvage: Knuckled at both selvages.

### 2.3 FENCE FRAMEWORK

- A. All material shall be new and products of recognized reputable manufacturers. Used, re-rolled, or re-galvanized materials will not be accepted.
- B. Framework, including posts and rails, shall be standard weight, Schedule 40, hot dip galvanized round steel pipe complying with ASTM F1083. Comply with ASTM F1043, external and internal zinc coating Type A, consisting of not less than 1.8 oz/ft<sup>2</sup> zinc, and the following requirements.
  1. Fence Height: As indicated on Drawings.
  2. Terminal/Corner Posts: 2 7/8" O.D.
  3. Line Posts: 2 3/8" O.D.
  4. Rails and Braces: 1 5/8" O.D.
  5. Polymer (polyester) coating fused and adhered to the exterior zinc coating with minimum thickness of 3 mils per ASTM F1043.
    - a. Color: Black in accordance with ASTM F934, unless otherwise approved by Owner.

### 2.4 TENSION WIRE

- A. Polymer-Coated Steel Wire: 0.177-inch diameter, tension wire according to ASTM F1664, Class 2b over zinc-coated steel wire.
  1. Color: Black in accordance with ASTM F934.

### 2.5 FITTINGS

- A. Provide fittings according to ASTM F626.
- B. Post Caps: Provide for each post.
- C. Rail and Brace Ends: For each gate, corner, pull, and end post.
- D. Rail Fittings: Provide the following:
  1. Top Rail Sleeves: Hot-dip galvanized pressed steel complying with pressed-steel or round-steel tubing not less than 6 inches long.
  2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate and bottom rails to posts.
- E. Tension and Brace Bands: Pressed steel.

- F. Tension Bars: Steel, length not less than 2-inches shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.
- G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.
- H. Tie Wires, Clips, and Fasteners: According to ASTM F626.
  - 1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, according to the following:
    - a. Hot-Dip Galvanized Steel: 9-gauge 0.148-inch diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.
- I. Finish:
  - 1. Polymer coated color fittings: In compliance with ASTM F626.
    - a. Color: Black in accordance with ASTM F934, unless otherwise approved by Owner.

## 2.6 CONCRETE

- A. Concrete for post footings shall be normal weight concrete with not less than 3,500 psi at 28 days, 3-inch slump, and 1-inch maximum aggregate size.

## 2.7 GROUT AND ANCHORING CEMENT

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout, recommended in writing by manufacturer, for exterior applications.
- B. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating, and that is recommended in writing by manufacturer for exterior applications.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements.
  - 1. Do not begin installation before final grading is completed unless otherwise permitted by Landscape Architect.
  - 2. Verify layout information for chain link fences and gates shown on Shop Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

### 3.3 CHAIN-LINK FENCE INSTALLATION

- A. Install chain-link fencing according to ASTM F567 and more stringent requirements specified.
  - 1. Install fencing on established boundary lines inside property line.
- B. Post Setting: Form or core drill holes not less than 3/4 inch larger than outside diagonal dimension of post.
  - 1. Set posts plumb in concrete footings in accordance with ASTM F567. Minimum footing depth shall be per manufacturer's recommendations, but no less than 3 feet. Minimum footing diameter shall be per manufacturer's recommendations, but no less than 12-inches. For swing gate posts, the foundation diameter shall be not less than 18-inches. Top of concrete footing shall be as indicated on Drawings, crowned to shed water away from posts.
  - 2. Concrete Fill: Place concrete around posts to dimensions indicated on Drawings and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
  - 3. Posts set in grouted core drilled footers are permissible only if shown by Engineer's analysis to be sufficient in strength for the application.
    - a. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink grout, mixed and placed to comply with grout manufacturer's written instructions. Finish and slope top surface of grout to drain water away from post
- C. Terminal Posts: Install terminal end, corner, and gate posts according to ASTM F567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more. For runs exceeding 500 feet, space pull posts an equal distance between corner or end posts.
- D. Line Posts: Space line posts uniformly as shown on Drawings.
- E. Post Bracing and Intermediate Rails: Install according to ASTM F567, maintaining plumb position and alignment of fence posts. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.
  - 1. Locate horizontal braces at midheight of fabric 72 inches or higher, on fences with top rail, and at two-third fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.
- F. Tension Wire: Install according to ASTM F567, maintaining plumb position and alignment of fence posts. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24-inches o.c. Install tension wire in locations indicated before stretching fabric. Provide horizontal tension wire at the following locations:

1. Extended along top and bottom of fence fabric. Install top tension wire through post cap loops. Install bottom tension wire within 6-inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.
- G. Top Rail: Install according to ASTM F567, maintaining plumb position and alignment of fence posts. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.
- H. Intermediate and Bottom Rails: Secure to posts with fittings.
- I. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 2-inch bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
- J. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts, with tension bands spaced not more than 15-inches o.c.
- K. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric according to ASTM F626. Bend ends of wire to minimize hazard to individuals and clothing.
  1. Maximum Spacing: Tie fabric to line posts at 12-inches o.c. and to braces at 24-inches o.c.

### 3.4 ADJUSTING

- A. Touch up, repair, and replace damaged products before Substantial Completion.

### 3.5 CLEANING

- A. Contractor shall clean jobsite and legally dispose of excess materials.

END OF SECTION 323113

**SECTION 323119**  
**DECORATIVE METAL FENCES AND GATES**

**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. Decorative steel fencing, gates, and accessories.

**1.3 REFERENCES**

- A. American Society for Testing and Materials (ASTM) Standards as listed in Specification.

**1.4 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Ziehler Playground, 200-64 E. Olney Avenue, Philadelphia, PA 19120.

**1.5 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Steel fencing and gate components.
  - 2. Accessories.
  - 3. Paint coatings.
- B. Shop Drawings: For fencing and gates.
  - 1. Include plans, elevations, sections, and details for decorative fencing, including post spacing, picket spacing, rail spacing, location of corner and end posts, and anchorage.
  - 2. Include plans, elevations, sections, and details for gates, including attachments to other Work.
- C. Statement: Certification from manufacturer that fencing materials and accessories meet or exceed requirements listed in Part 2 Materials.

**1.6 INFORMATIONAL SUBMITTALS**

- A. Field quality-control reports.



- B. Sample Warranty: For special warranty.

#### 1.7 WARRANTY

- A. All Work under this section shall be warranted against defects in materials and workmanship for not less than five (5) years from the date of Substantial Completion.
- B. Structural fence components shall have minimum ten (10) year warranty against cracking, chipping, peeling, blistering, or corroding of the coating.

#### 1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: For each type of product required for the Work of this section, provide products from one source with resources to provide decorative metal fencing and gates of consistent quality in appearance and physical properties.
  - 1. Manufacturer shall specialize in manufacturing decorative fencing products with a minimum five (5) years of experience in successfully producing metal fencing fabrications equivalent to that indicated for Project.
- B. Installer Qualifications: Company with demonstrated successful experience installing similar projects and products and have at least five (5) years demonstrated experience.
- C. Coordinate Work with Work of other sections. Verify dimensions and Work of other trades which adjoin materials of this section before installing items specified.
- D. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
  - 1. Include minimum 6-foot length of fence complying with requirements.
  - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.9 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle materials and products in strict compliance with manufacturer's written instructions and industry standards.
- B. Deliver materials to site in undamaged condition. Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Store products indoors in manufacturer's original containers and packaging with labels clearly identifying product name and manufacturer.
- C. Materials shall be stored in such a manner to ensure proper protection against damage, weather, vandalism and theft. Store materials off the ground to provide protection against oxidation caused by ground contact.

## 1.10 PROJECT CONDITIONS

- A. Field Measurements: Check actual locations of property lines, walls, curbs, ramps, sleeves, and other construction to which fence must fit or meet by actual field measurements before fabrications and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

## PART 2 - PRODUCTS

### 2.1 DECORATIVE STEEL FENCES

- A. Decorative Steel Fences: Fences made from steel tubing and shapes.
  - 1. Basis of Design of Decorative Steel Fencing shall be:
    - a. Aegis II Industrial Ornamental Steel Fence, Majestic Style, 3 rails, manufactured by  
Ameristar Fence Products  
1555 N. Mingo Road  
Tulsa, OK 74116
  - Or approved equal. Products from other qualified manufacturers having a minimum five (5) years experience manufacturing decorative steel fencing may be accepted as an approved equal by Landscape Architect if approved in writing. Fencing submitted as approved equal must meet specifications for design, size, gauge of metal parts and fabrication, and fence style and height.
- B. Manufacturer shall supply a total fence system including all components (i.e. panels, posts, gates, and hardware) required for the complete installation of fence system.
- C. Fence Panels and Posts: Steel shall conform to the requirements of ASTM A924/A924M, with a minimum yield strength of 45,000 psi. Steel shall be hot dipped galvanized to meet requirements of ASTM A653/A653M with a minimum zinc coating weight of 0.90 oz/ft<sup>2</sup>, Coating Designation G-90.
  - 1. Fence line posts and gate posts shall be per manufacturer's standard sizes and as indicated on Drawings.
- D. Pickets: Steel shall be 1" square x 14 Ga. Tubing.
- E. Rails: Steel channel with outside cross-section dimension of 1 3/4" square and minimum thickness of 14 Ga. Picket holes shall be spaced at 4.715" o.c.
- F. Grommets: High-quality PVC
- G. Finish
  - 1. Thermal stratification coating, including pre-treatment wash, electrostatic spray application of epoxy base (min. thickness 2 mils), and separate electrostatic spray application of polyester powder coat finish (min. thickness 2 mils).
  - 2. Color shall be black. Other color options shall only be approved with written approval by Owner and Landscape Architect.

- H. Post Caps: Formed steel and hot-dipped galvanized after forming, weathertight closure cap. Provide one flat style post cap for each post.
  - 1. Color to match fencing.
- I. Accessories: Provide manufacturer's brackets and fasteners as required to install complete fence system. Accessories shall be galvanized with finish to match framing.
- J. Non-shrink Non-Metallic Grout: Premixed, factory packaged nonstaining, noncorrosive, nongaseous grout complying with CE CRD-C621. Provide grout specifically recommended by manufacturer for exterior applicates of type specified in this section.
- K. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A123/A123M. For hardware items, hot-dip galvanize to comply with ASTM A153/A153M.

## 2.2 SWING GATES

- A. Basis of Design of Decorative Steel Swing Gates shall be:
  - 1. Aegis II Industrial Ornamental Swing Gate, Majestic Style, 3 rails, manufactured by Ameristar Fence Products  
1555 N. Mingo Road  
Tulsa, OK 74116
- B. Gate Frame Height: 48 inches.
- C. Gate Opening Width:
  - 1. Single Gate: 48 inches.
  - 2. Double Gate: 96 inches.
- D. Frame Corner Construction: Per manufacturer's specifications.
- E. Additional Rails: Provide as indicated, complying with requirements for fence rails.
- F. Picket Size, Configuration, and Spacing: Comply with requirements for adjacent fence.
- G. Hardware: Latches permitting operation from both sides of gate, hinges, and keepers for each gate leaf. Provide cane bolts for pairs of gates. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.
- H. Hinges: 180 degree swing as indicated on Drawings.
- I. Cane Bolts: Provide for inactive leaf of pairs of gates. Fabricated from 1/2-inch diameter, round steel bars, hot-dip galvanized after fabrication. Finish to match gates. Provide galvanized-steel pipe strikes to receive cane bolts in closed position both open and closed positions.
- J. Finish exposed welds to comply with NOMMA Guideline 1, Finish #2 - completely sanded joint, some undercutting and pinholes okay.

- K. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A123/A123M. For hardware items, hot-dip galvanize to comply with ASTM A153/A153M.
- L. Steel Finish: To match adjacent fencing.

## 2.3 MISCELLANEOUS MATERIALS

- A. Concrete: Normal-weight, air-entrained, ready-mix concrete complying with a minimum 28-day compressive strength of 3500 psi, 3-inch slump, and 1-inch maximum aggregate size.
- B. Nonshrink Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M and specifically recommended by manufacturer for exterior applications.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, construction layout, and other conditions affecting performance of the Work.
- B. Inspect and prepare substrates using methods recommended by manufacturer for achieve best results for the substrates under Project conditions.
  - 1. Do not being installation until substrates have been properly cleaned and prepared per manufacturer's written recommendations.
- C. Do not begin installation before final grading is completed unless otherwise permitted by Landscape Architect.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.
  - 1. Notify Landscape Architect in writing if any conditions exist which are detrimental to the proper installation of the Work. Starting of Work shall be considered as acceptance of existing surface and conditions, and any claims thereafter will be disregarded.
- E. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions and directions for installation of anchorages, including sleeves and miscellaneous items having integral anchors that are to be utilized.

### 3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

### 3.3 DECORATIVE STEEL FENCE INSTALLATION

- A. Install fence in accordance with manufacturer's written instructions, level, plumb, and secure at correct height and spacing.
- B. Install all items in true alignment, free of springing, forcing, or distortion.
- C. Fence posts shall be spaced as indicated on Drawings. For installations that must be raked to follow sloping grades, the post spacing dimension must be measured along the grade. Fence panels shall be attached to posts with brackets supplied by manufacturer.
- D. Post Setting: Form or core drill holes not less than 3/4-inch larger than outside diagonal dimension of post.
  - 1. Set posts plumb in concrete footings. Minimum footing depth shall be per manufacturer's recommendations or as indicated on Drawings, but no less than 3 feet. Minimum footing diameter shall be per manufacturer's recommendations, but no less than 12-inches. Top of concrete footing shall be as indicated on Drawings, crowned to shed water away from posts.
  - 2. Concrete Fill: Place concrete around posts to dimensions indicated on Drawings and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
  - 3. Posts set in grouted core drilled footers are permissible only if shown by Engineer's analysis to be sufficient in strength for the application.
    - a. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink grout, mixed and placed to comply with grout manufacturer's written instructions. Finish and slope top surface of grout to drain water away from post.
- E. Fence Panels: Secure to both sides of each post. Secure to posts as per manufacturer's written instructions. Install panels so bottom of panel is above ground level as indicated on Drawings.
- F. Install post caps, finials, and other accessories as specified to complete fence.
- G. Clean and touch-up paint all abraded, welded and scratched surfaces with matching paint provided by manufacturer. Repair galvanizing prior to finish coating.

### 3.4 SWING GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, at correct height and secure for full opening without interference.
  - 1. Gate posts shall be spaced according to manufacturer's gate drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected. Type and quantity of gate hinges shall be based on the application; height, and number of gate cycles. The manufacturer's gate drawings shall identify the necessary gate hardware required for the application. Gate hardware shall be provided by the manufacturer and shall be installed per manufacturer's written instructions.
- B. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.5 ADJUSTING

- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Lubricate hardware and other moving parts.
- C. Touch up, repair, and replace damaged products before Substantial Completion.

3.6 CLEANING

- A. Contractor shall clean jobsite and legally dispose of excess materials.

END OF SECTION 323119

**SECTION 323300  
SITE FURNISHINGS**

**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. Benches.
  - 2. Tables.
  - 3. Trash and Recycling Receptacles.
  - 4. Hydration Station.
- B. Related Requirements:
  - 1. Section 312000 "Earth Moving" for excavation for installing concrete footings.

**1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.
- C. Samples for Initial Selection: For units with factory-applied finishes.
- D. Samples for Verification: For each type of exposed finish, not less than 6-inch- long linear components and 4-inch- square sheet components.
- E. Product Schedule: For site furnishings, use same designations indicated on Drawings.

**1.4 CLOSEOUT SUBMITTALS**

- A. Maintenance Data: For site furnishings to include in maintenance manuals.

**1.5 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Site furnishings manufacturer must be approved by Philadelphia Parks and Recreation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

#### A. Source Limitations: Obtain site furnishings from the following approved manufacturers:

1. DuMor, Inc.  
P.O. Box 142, Mifflintown, PA 17059  
Phone: 800-598-4018  
[www.dumor.com](http://www.dumor.com)
  - a. Local Representative:  
General Recreation, Inc.  
P.O. Box 440, Newtown Square, PA 19073  
Phone: 800-726-4793  
[www.generalrecreationinc.com](http://www.generalrecreationinc.com)
2. Wausau Tile  
P.O. Box 1520, Wausau, WI 54402  
Phone: 800-388-8728  
<https://wausautile.com>
  - a. Local Representative:  
David Grimes  
Phone: 215-779-9244  
[dgrimes@wasautilenj.com](mailto:dgrimes@wasautilenj.com)
3. Elkay Manufacturing Company  
2222 Camden Court, Oak Brook, IL 60523  
Phone: 800-476-4106  
[www.elkay.com](http://www.elkay.com)

### 2.2 BENCHES

- #### A. Backed Bench: Bench 165-60D (Philadelphia Parks and Recreation Standard), manufactured by DuMor, Inc.
1. Frame: Steel
  2. Slats: Douglas Fir
  3. 'Fairmount' Center Armrest
  4. Frame Color: Black
  5. Quantity: See Site Furnishings Schedule
  6. Installation: S-2 Surface mount with tamper-proof hardware per manufacturer's recommendations and specifications.
- #### B. Backless Bench: Bench 166-60D Backless (Philadelphia Parks and Recreation Standard), manufactured by DuMor, Inc.
1. Frame: Steel



2. Slats: Douglas Fir
  3. 'Fairmount' Center Armrest
  4. Frame Color: Black
  5. Quantity: See Site Furnishings Schedule
  6. Installation: S-2 Surface mount with tamper-proof hardware per manufacturer's recommendations and specifications.
- C. Players Bench: Bench 139 Series PL (Philadelphia Parks and Recreation Standard), manufactured by DuMor, Inc.
1. Frame: Steel
    - a. Frame Color: Black
  2. Slats: Recycled Plastic
    - a. Slat Color: Walnut
  3. Length: 6'
  4. Quantity: See Site Furnishings Schedule
  5. Installation: S-1 Embedment per manufacturer's recommendations and specifications.
- D. 8' Concrete Spectator Bench: TF5076 Concrete Bench, manufactured by Wausau Tile.
1. Material: Concrete
  2. Size: 96" long x 18" wide x 18" high
  3. Color: A20 (Acid Wash White)
  4. Quantity: See Site Furnishings Schedule
  5. Installation: Install in concrete pavement using threaded inserts per manufacturer's recommendations and specifications.
- E. 6' Concrete Spectator Bench: TF5113 Concrete Bench, manufactured by Wausau Tile.
1. Material: Concrete
  2. Size: 72" long x 18" wide x 18" high
  3. Color: A20 (Acid Wash White)
  4. Quantity: See Site Furnishings Schedule
  5. Installation: Install in concrete pavement using threaded inserts per manufacturer's recommendations and specifications.
- F. 4' Concrete Spectator Bench: TF5117 Concrete Bench, manufactured by Wausau Tile.
1. Material: Concrete
  2. Size: 48" long x 18" wide x 18" high
  3. Color: A20 (Acid Wash White)
  4. Quantity: See Site Furnishings Schedule
  5. Installation: Install in concrete pavement using threaded inserts per manufacturer's recommendations and specifications.

## 2.3 TABLES

- A. Fixed Table with Benches, 3 Seats: Table 76, #76-33PL (Philadelphia Parks and Recreation Standard), manufactured by DuMor, Inc.
1. Frame: Steel
    - a. Frame Color: Black
  2. Slats: Recycled Plastic
    - a. Slat Color: Walnut

3. Seats: Three (3)
4. Quantity: See Site Furnishings Schedule
5. Installation: S-1 embedment per manufacturer's recommendations and specifications.

B. Fixed Table with Benches, 4 Seats: Table 76, #76-34PL, manufactured by DuMor, Inc.

1. Frame: Steel
  - a. Frame Color: Black
2. Slats: Recycled Plastic
  - a. Slat Color: Walnut
3. Seats: Four (4)
4. Quantity: See Site Furnishings Schedule
5. Installation: S-1 embedment per manufacturer's recommendations and specifications.

## 2.4 TRASH AND RECYCLING RECEPTACLES

A. Trash Receptacle: Receptacle #157-32-FTO (Philadelphia Parks and Recreation Standard), manufactured by DuMor, Inc.

1. Frame: Steel
  - a. Frame Color: Black
2. Size: 32-Gallon
3. Lids and Tops: Top Deposit
4. Quantity: See Site Furnishings Schedule
5. Installation: Embedded per construction Details.

B. Recycling Receptacle: Receptacle #157-32-FTO (Philadelphia Parks and Recreation Standard), manufactured by DuMor, Inc.

1. Frame: Steel
  - a. Frame Color: Recycle Blue
2. Size: 32-Gallon
3. Lids and Tops: Top Deposit
4. Quantity: See Site Furnishings Schedule
5. Installation: Embedded per construction Details.

## 2.5 HYDRATION STATION

A. Hydration Station: Outdoor EZH2O Bottle Filling Station Wall Mount, with Single Fountain Non-Filtered Non-Refrigerated, #LK4408BFBLU, manufactured by Elkay Manufacturing Company.

1. Color: Blue
2. Quantity: See Site Furnishings Schedule.
3. Installation: Wall mount, install per manufacturer's instructions.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.
- B. Verify that substrates are stable and capable of supporting the weight of items covered under this section.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and securely anchored positioned at locations indicated on Drawings.
- D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
- E. Install in conformance to applicable ADA guidelines and Owner's established accessibility policies.

END OF SECTION 323300

**SECTION 329113  
SOIL PREPARATION**

**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 planting soils, including Structural Soil, specified according to performance requirements of the mixes.
- B. Related Requirements:
  - 1. Section 329200 "Turf and Grasses" for placing planting soil for turf and grasses.
  - 2. Section 329300 "Plants" for placing planting soil for plantings.

**1.3 REFERENCES**

- A. American Society for Testing and Materials (ASTM) Standards as listed in Specification.

**1.4 DEFINITIONS**

- A. AAPFCO: Association of American Plant Food Control Officials.
- B. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.
- C. CEC: Cation exchange capacity.
- D. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.
- E. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.
- F. Imported Soil: Soil that is transported to Project site for use.
- G. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.

- H. NAPT: North American Proficiency Testing Program. An SSSA program to assist soil-, plant-, and water-testing laboratories through interlaboratory sample exchanges and statistical evaluation of analytical data.
- I. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."
- J. Planting Soil: Imported soil or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- K. RCRA Metals: Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.
- L. SSSA: Soil Science Society of America.
- M. Structural Soil: Engineered soil medium able to be compacted for pavement design, loading requirements and installation yet permits plant root growth.
- N. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- O. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- P. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.
- Q. USCC: U.S. Composting Council.

## 1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at project site.

## 1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  1. Include recommendations for application and use.
  2. Include test data substantiating that products comply with requirements.
  3. Include sieve analyses for aggregate materials.
  4. Material Certificates: For each type of imported soil and soil amendment and fertilizer before delivery to the site, according to the following:
    - a. Manufacturer's qualified testing agency's certified analysis of standard products.
    - b. Analysis of fertilizers, by a qualified testing agency, made according to AAPFCO methods for testing and labeling and according to AAPFCO's SUIP #25.
    - c. Analysis of nonstandard materials, by a qualified testing agency, made according to SSSA methods, where applicable.

B. Samples: For each bulk-supplied material, 1-quart (1-L) volume of each in sealed containers labeled with content, source, and date obtained. Each Sample shall be typical of the lot of material to be furnished and provide an accurate representation of composition, color, and texture.

C. Structural Soil:

1. Structural Soil shall be CU-Structural Soil, or approved equal based on specific site requirements in combination with testing regimen limits defined for Structural Soil.
  - a. CU-Structural Soil is a proprietary material patented by Cornell University (US Patent #5,849,069) and marketed under the registered trademark, CU-Structural Soil. Only licensed companies are authorized to produce this material, meeting the specifications described in this text. For a list of licensed CU-Structural Soil producers, call AMEREQ, INC. at 800-832-8788.
2. At least thirty (30) days prior to ordering materials, the installing contractor shall submit to the Landscape Architect representative samples, certificates, manufacturer's literature and test results for materials specified below. No materials shall be ordered until the required samples, certificates, manufacturer's literature, producer's current license and test results have been reviewed and approved by the Landscape Architect. The Landscape Architect reserves the right to reject any material that does not meet CU-Structural Soil specifications. Delivered materials shall closely match the approved samples.
3. Submit from licensed producer,  $\frac{1}{2}$  cubic foot representative sample of clay loam, one cubic foot representative sample of crushed stone, and one cubic foot representative sample of CU-Structural Soil mix for approval. In the event of multiple source fields for clay loam, submit a minimum of one set of samples per source field or stockpile. The samples of all clay loam, crushed stone, and CU-Structural Soil shall be submitted to the engineer as a record of the soil color and texture.
4. Submit soil test analysis reports for sample of clay loam from an independent soil-testing laboratory. The testing laboratory for particle size and chemical analysis may include a public agricultural extension service agency.
  - a. Submit a mechanical analysis of the clay loam sample and particle size analysis including the following gradient of mineral content:

<b>USDA Designation</b>	<b>Size in millimeters (mm)</b>
Gravel	+2mm
Sand	0.05 – 2mm
Silt	0.002 – 0.05mm
Clay	minus 0.002mm

Sieve analysis shall be performed and compared to USDA Soil Classification System.

Sieve analysis shall be done by a combined hydrometer and wet sieving using sodium hexametaphosphate as a dispersant in compliance with ASTM D422 after destruction of organic matter by hydrogen peroxide.

- b. Submit a chemical analysis, performed in accordance with current AOAC Standards, including the following:
  - 1) pH and buffer pH.

- 2) Percent organic matter as determined by the loss of ignition of oven dried samples. Test samples shall be oven dried to a constant weight at a temperature of 230 degrees F, plus or minus 9 degrees.
  - 3) Analysis for nutrient levels by parts per million.
  - 4) Soluble salt by electrical conductivity of a 1:2 soil/water sample measured in Millimho per cm.
  - 5) Cation Exchange Capacity (CEC).
  - 6) Carbon/Nitrogen Ratio.
5. Submit one cubic foot sample of crushed stone which will be used in production of CU-Structural Soil.
- a. Provide particle size analysis:

<b>USDA Designation</b>	<b>Size in millimeters (mm)</b>
3"	+76mm
2-1/2"	63-76mm
2"	50-63mm
1-1/2"	37-50mm
1"	25-37mm
3/4"	19-25mm
Fine Gravel	2-19mm

- b. Provide the manufacturers analysis of the loose and rodded unit weight.
  - c. Losses from LA Abrasion tests- not to exceed 40%.
  - d. Minimum 90% with 2 or more fractured faces.
  - e. Percent pore space analysis.
6. At the Landscape Architect's discretion, the sample of CU-Structural Soil may be tested for the following:
- a. Compaction in accordance with ASTM D698 / AASHTO T99.
  - b. California Bearing Ratio in accordance with ASTM D1883: soaked CBR shall equal or exceed a value of 50.
  - c. Measured dry-weight percentage of stone in the mixture.
7. The approved CU-Structural Soil sample shall be the standard.
8. Any deviation from the specified crushed stone and clay loam specifications shall be approved by Amereq, Inc.

## 1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For each testing agency.
- B. Preconstruction Test Reports: For preconstruction soil analyses specified in "Preconstruction Testing" Article.
- C. Field quality-control reports.

## 1.8 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.
1. Laboratories: Subject to compliance with requirements, qualified independent soil testing services include, but are not limited to:
    - a. Penn State College of Agricultural Sciences, Agricultural Analytical Services Lab  
111 Ag Analytical Services Lab, University Park, PA 16802  
Phone: 814-863-0841  
Email: [aaslab@psu.edu](mailto:aaslab@psu.edu)  
[www.agsci.psu.edu](http://www.agsci.psu.edu)
    - b. Rutgers Soil Testing Laboratory  
Rutgers, The State University of New Jersey  
57 US Highway 1, New Brunswick, NJ 08901-8554  
Phone: 848-932-9295  
Email: [soiltest@njaes.rutgers.edu](mailto:soiltest@njaes.rutgers.edu)  
<https://njaes.rutgers.edu/soil-testing-lab/>
  2. Multiple Laboratories: At Contractor's option, work may be divided among qualified testing laboratories specializing in physical testing, chemical testing, and fertility testing.
- B. Structural Soil:
1. Qualifications for Supplier and Installer.
    - a. Supplier shall provide certification that structural soil meets or exceeds requirements of CU-Structural Soil.
    - b. The work of this section should be performed by a contracting firm which has a minimum of five years' experience. Proof of this experience shall be submitted.

## 1.9 PRE-CONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction soil analyses on existing on-site soil and imported soil.
1. Notify Landscape Architect at least seven (7) days in advance of the dates and times when laboratory samples will be taken.
- B. Preconstruction Soil Analyses: For each unamended soil type, perform testing on soil samples and furnish soil analysis and a written report containing soil-amendment and fertilizer recommendations by a qualified testing agency performing the testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.
1. Have testing agency identify and label samples and test reports according to sample collection and labeling requirements.



## 1.10 PRE-CONSTRUCTION SOIL-SAMPLING REQUIREMENTS

- A. General: Extract soil samples according to requirements in this article.
- B. Sample Collection and Labeling: Have samples taken and labeled by Contractor in presence of Landscape Architect under the direction of the testing agency.
  - 1. Number and Location of Samples: Minimum number of representative soil samples to be determined by testing agency for each soil to be used or amended for landscaping purposes.
  - 2. Procedures and Depth of Samples: To be determined by testing agency.
  - 3. Division of Samples: Split each sample into two, equal parts. Send half to the testing agency and half to Owner for its records.
  - 4. Labeling: Label each sample with the date, location keyed to a site plan or other location system, visible soil condition, and sampling depth.

## 1.11 PRE-CONSTRUCTION TESTING REQUIREMENTS

- A. General: Perform tests on soil samples according to requirements in this article.
- B. Physical Testing:
  - 1. Soil Texture: Soil-particle, size-distribution analysis by the following methods according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods":
    - a. Sieving Method: Report sand-gradation percentages for very coarse, coarse, medium, fine, and very fine sand; and fragment-gradation (gravel) percentages for fine, medium, and coarse fragments; according to USDA sand and fragment sizes.
    - b. Hydrometer Method: Report percentages of sand, silt, and clay.
  - 2. Bulk Density: Analysis according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
  - 3. Total Porosity: Calculate using particle density and bulk density according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
  - 4. Water Retention: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
  - 5. Saturated Hydraulic Conductivity: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods"; at 85 percent compaction according to ASTM D698 (Standard Proctor).
- C. Chemical Testing:
  - 1. CEC: Analysis by sodium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."
  - 2. Clay Mineralogy: Analysis and estimated percentage of expandable clay minerals using CEC by ammonium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
  - 3. Metals Hazardous to Human Health: Test for presence and quantities of RCRA metals including aluminum, arsenic, barium, copper, cadmium, chromium, cobalt, lead, lithium, and vanadium. If RCRA metals are present, include recommendations for corrective action.
  - 4. Phytotoxicity: Test for plant-available concentrations of phytotoxic minerals including aluminum, arsenic, barium, cadmium, chlorides, chromium, cobalt, copper, lead, lithium, mercury, nickel, selenium, silver, sodium, strontium, tin, titanium, vanadium, and zinc.
- D. Fertility Testing: Soil fertility analysis according to standard laboratory protocol of SSSA NAPT NEC-67, including the following:

1. Percentage of organic matter.
  2. CEC, calcium percent of CEC, and magnesium percent of CEC.
  3. Soil reaction (acidity/alkalinity pH value).
  4. Buffered acidity or alkalinity.
  5. Nitrogen ppm.
  6. Phosphorous ppm.
  7. Potassium ppm.
  8. Manganese ppm.
  9. Manganese-availability ppm.
  10. Zinc ppm.
  11. Zinc availability ppm.
  12. Copper ppm.
  13. Sodium ppm.
  14. Soluble-salts ppm.
  15. Presence and quantities of problem materials including salts and metals cited in the Standard protocol. If such problem materials are present, provide additional recommendations for corrective action.
  16. Other deleterious materials, including their characteristics and content of each.
- E. Organic-Matter Content: Analysis using loss-by-ignition method according to SSSA's "Methods of Soil Analysis - Part 3-Chemical Methods."
- F. Recommendations: Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated to produce satisfactory planting soil suitable for healthy, viable plants indicated. Include, at a minimum, recommendations for nitrogen, phosphorous, and potassium fertilization, and for micronutrients.
1. Fertilizers and Soil Amendment Rates: State recommendations in weight per 1,000 sq. ft. for 6-inch depth of soil.
  2. Soil Reaction: State the recommended liming rates for raising pH or sulfur for lowering pH according to the buffered acidity or buffered alkalinity in weight per 1000 sq. ft. for 6-inch depth of soil.

#### 1.12 POST-CONSTRUCTION TESTING

- A. Post-Construction Testing Service: Engage a qualified testing agency to perform post-construction analyses on amended planting soil with compost incorporated.
1. Notify Landscape Architect seven (7) days in advance of the dates and times when laboratory samples will be taken.
- B. Post-Construction Soil Analyses: For each amended soil, perform testing on soil samples and furnish soil analysis and a written report by a qualified testing agency performing the testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.
1. Have testing agency identify and label samples and test reports according to sample collection and labeling requirements.

#### 1.13 POST-CONSTRUCTION SOIL-SAMPLING REQUIREMENTS

- A. General: Perform tests on soil samples according to the requirements in this article.

- B. Fertility Testing:
1. Percentage of organic matter.
    - a. Organic matter content must be 4% minimum.
  2. CEC, calcium percent of CEC, and magnesium percent of CEC
  3. Soil reaction (acidity / alkalinity pH value).
    - a. pH levels must be between 5.5 and 6.0. Lower pH by using elemental sulfur product.  
Peat moss or copper sulfate may not be used to lower pH.
  4. Buffered acidity or alkalinity.
  5. Nitrogen ppm.
  6. Phosphorus ppm.
  7. Potassium ppm.
  8. Manganese ppm.
  9. Manganese-availability ppm.
  10. Zinc ppm.
  11. Zinc-availability ppm.
  12. Copper ppm.
  13. Sodium ppm.
  14. Soluble-salts ppm.
    - a. Soluble-salts measurement must be less or equal to 2 mmho/cm.
  15. Presence and quantities of problem materials including salts and metals cited in the Standard protocol. If such problem materials are present, provide additional recommendations for corrective action.
  16. Other deleterious materials, including their characteristics and content of each.
  17. Percolation test to ensure adequate drainage and proper mixing of compost.
- C. Recommendations: The analysis tests shall show recommendations for soil additives or fertilizers to correct soil mixes' deficiencies as necessary.
- D. Deficiencies: Nutrient deficiencies shall be corrected at time of installation.

#### 1.14 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.
- B. Bulk Materials:
1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
  2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
  3. Do not move or handle materials when they are wet or frozen.
  4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.
- C. Structural Soil:

1. Delivered CU-Structural Soil shall be at or near optimum compaction moisture content as determined by AASHTO T 99 (ASTM D 698) and should not be placed in frozen, wet or muddy sites.
2. Protect CU-Structural Soil from exposure to excess water and from erosion at all times. Do not store CU-Structural Soil unprotected. Do not allow excess water to enter site prior to compaction. If water is introduced into the CU-Structural Soil after grading, allow water to drain to optimum compaction moisture content.
3. All areas to receive CU-Structural Soil shall be inspected by the installing contractor before starting work and all defects such as incorrect grading, compaction, and inadequate drainage shall be reported to the engineer prior to beginning this work.

## PART 2 - PRODUCTS

### 2.1 PLANTING SOIL

- A. Planting Soil: Existing, on-site surface soil with the duff layer, if any, retained; and stockpiled on site and modified to produce viable planting soil, or imported, naturally formed or manufactured soil from off-site sources consisting of fertile, friable, naturally fine sandy loam, (USDA classification for soil consisting of 10-20 percent clay, 30-50 percent silt and 50-70 percent fine sand, particle 0.10-0.25 mm.) pH range of 5.5 to 7, 4 percent organic material minimum, and with sufficient structure to give good tilth and aeration
  1. Using preconstruction soil analyses and materials specified in other articles of this Section, amend existing, on-site surface soil to become planting soil complying with the requirements.
  2. For off-site sources, take imported, unamended soil from sources that are naturally well-drained sites where topsoil occurs at least 4 inches deep, not from agricultural land, bogs, or marshes; and that do not contain undesirable organisms or disease-causing plant pathogens. Soil shall not contain any noxious weeds or invasive plants, including, but not limited to, quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and brome grass.
  3. Planting Soil shall not include any of the following:
    - a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
    - b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand 1-inch or larger.
  4. Amend existing or imported soil with materials specified in other articles of this Section to become planting soil complying with the following requirements:
    - a. Particle Size Distribution by Separates:
      - Fine Sand: 50% to 70% percent by dry weight.
      - Silt: 30% to 50% percent by dry weight.
      - Clay: 10% to 20% percent by dry weight.
    - b. Percentage of Organic Matter: Minimum 4% by volume.
    - c. Soil Reaction: pH of 5.5 to 7 in accordance with pH range of plants specified.
    - d. CEC of Clay Fraction: Maximum 15 meq/100 mL at pH of 7.0.
    - e. Soluble-Salt Content: 5 to 10- dS/m measured by electrical conductivity.
    - f. RCRA Metals: Below maximum limits established by the EPA.
    - g. Phytotoxicity: Below phytotoxicity limits established by SSSA.

5. Acceptable ranges for base saturation percentages are:

Element	Desired % Range	Ideal %
Ca	60-70%	68%
Mg	10-20%	12%
K	2-5%	5%
Na	0.5-3%	0.75%
Other bases (variable)	2-4%	3.75%
Exchangeable Hydrogen	10-15%	10.5%

B. Unacceptable Properties

1. Clean soil of the following:
  - a. Unacceptable Materials: concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, litter or other extraneous materials that are harmful to plant growth.
  - b. Unsuitable Materials: stones 1-inche or larger in any dimension, noxious seeds, sticks, brush, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 8% by dry weight of the imported soil.

2.2 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
  1. Class: T, with a minimum of 99 percent passing through a No. 8 sieve and a minimum of 75 percent passing through a No. 60 sieve.
- B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 sieve and a maximum of 10 percent passing through a No. 40 sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Perlite: Horticultural perlite, soil amendment grade.
- E. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through a No. 50 sieve.
- F. Sand: Clean, washed, natural or manufactured, free of toxic materials, and according to ASTM C33/C33M.
- G. Diatomaceous Earth: Horticultural diatomaceous earth, soil amendment grade.

2.3 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter produced by composting feedstock, and bearing USCC's "Seal of Testing Assurance," and as follows:

1. Feedstock: Compost may be derived from: agricultural, food, or industrial residuals; biosolids (treated sewage sludge); yard trimmings; source-separated or mixed solid waste. The product shall contain no substances toxic to plants and shall be reasonably free (< 1% by dry weight) of man-made foreign matter. The compost will possess no objectionable odors and shall not resemble the raw material from which it was derived. Do not use compost that has received the addition of liming agents or ash by-products. The product shall be certified through the U.S. Composting Council's (USCC) Seal of Testing Assurance (STA) Program.
2. Reaction: pH of 5.5 to 8
3. Soluble-Salt Concentration: Less than 5 dS/m.
4. Moisture Content: 35 to 55 percent by weight.
5. Particle Size: 100 percent passing through a 1/2-inch sieve.
6. The compost supplier shall test all compost products within 90 Calendar Days prior to application. Samples shall be collected using the Seal of Testing Assurance (STA) sample collection protocol. The sample collection protocol can be obtained from the U.S. Composting Council, 4250 Veterans Memorial Highway, Suite 275, Holbrook, NY 11741 Phone: (631) 737-4931, [www.compostingcouncil.org](http://www.compostingcouncil.org).
  - a. The sample shall be sent to an independent STA Program approved laboratory. The compost supplier shall pay for the test. A copy of the approved independent STA Program laboratory test report shall be submitted to the Landscape Architect prior to initial application of the compost. Seven days prior to application, the Contractor shall submit a sample of each type of compost to be used on the project to the Landscape Architect.
7. Compost not conforming to the above requirements or taken from a source other than those tested and accepted shall be immediately removed from the project and replaced at no cost to the Owner.
8. The Contractor shall submit the following information to the Landscape Architect for approval:
  - a. The supplier shall verify in writing and provide lab analyses that the Materials comply with the processes, testing, and standards specified in these Specifications. An independent STA Program certified laboratory shall perform the analysis.
  - b. A copy of the producer's STA certification as issued by the U.S. Composting Council.

## 2.4 FERTILIZERS

- A. As required by soil analysis and recommendations.
- B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
  1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.

## 2.5 CU-STRUCTURAL SOIL

- A. Structural Soil shall be CU-Structural Soil, or approved equal based on specific site requirements in combination with testing regiment limits defined for Structural Soil.

- a. CU-Structural Soil is a proprietary material patented by Cornell University (US Patent #5,849,069) and marketed under the registered trademark, CU-Structural Soil. Only licensed companies are authorized to produce this material, meeting the specifications described in this text. For a list of licensed CU-Structural Soil producers, call AMEREQ, INC. at 800-832-8788.

B. Clay Loam

1. Soil shall be a “loam” with a minimum clay content of 20% or a “clay loam” based on the “USDA classification system” as determined by mechanical analysis (ASTM D-422) and it shall be of uniform composition, without admixture of subsoil. It shall be free of stones, lumps, plants and their roots, debris and other extraneous matter. It shall not contain toxic substances harmful to plant growth. Clay loam shall contain not less than 2% or more than 5% organic matter as determined by the loss on ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 230 degrees F., plus or minus 9 degrees.
2. Mechanical analysis for the loam or clay loam shall be as follows:

<b>Textural Class</b>	<b>% of Total Weight</b>
Gravel	Less than 5%
Sand	20-45%
Silt	20-50%
Clay	20-40%

3. Chemical analysis: Meet, or be amended to meet the following criteria:
  - a. pH between 5.5 to 6.5.
  - b. Percent organic matter 2% - 5% by dry weight.
  - c. Adequate nutrient levels.
  - d. Soluble salt less than 1.0 mmho/cm.
  - e. Cation Exchange Capacity (CEC) greater than 10.
  - f. Carbon/Nitrogen ratio less than 33:1.
4. Loam or clay loam shall not come from USDA - classified prime farmland.

C. Fertilizer

1. Should nutrient analysis suggest that the loam or clay loam need additional nutrients, it shall be amended in accordance with Soil Analysis and for the specific plants specified on the Plant Schedule.

D. Sulfur

1. Sulfur shall be a commercial granular, 96% pure sulfur, with material and analysis appearing on the labeled container.
2. Sulfur used to lower pH shall be a ferrous sulfate formulation.
3. Application rates shall be dependent on soil test results.

E. Lime

1. Agricultural lime containing a minimum of 85% carbonates.
2. Application rates shall be dependent on soil test results.

F. Crushed Stone

1. The size of the crushed stone shall be 0.75 inches to 1.5 inches allowing for 5% – 10% being greater than 1.5 inches, and 5% – 10% less than 0.75 inches.
2. Acceptable aggregate dimensions will not exceed 2.5:1.0 for any two dimensions.
3. Minimum 90% with two or more fractured faces.
4. Results of Aggregate Soundness Loss test shall not exceed 18%.
5. Losses from LA Abrasion tests shall not exceed 40%.

G. Hydrogel

1. Hydrogel shall be a coated potassium propenoate-propenamide copolymer (Gelscape® Hydrogel Tackifier) as manufactured by Amereq, Inc. 800-832-8788.

H. Water

1. The installing contractor shall be responsible to furnish his own supply of water (if needed) free of impurities, to the site.

I. Composition

1. A uniformly blended urban tree mixture of crushed stone, clay loam and Gelscape® Hydrogel Tackifier, as produced by an Amereq-licensed company, mixed in the following proportion:

<b>Material</b>	<b>Unit of Weight</b>
Specified Crushed Stone	100 units dry weight
Specified Clay Loam	20-25 units (to achieve min. CBR of 50)
Gelscape® Hydrogel Tackifier	0.035 units dry weight
Moisture	ASTM D698 / AASHTO T-99 optimum moisture

PART 3 - EXECUTION

3.1 GENERAL

- A. Place planting soil and fertilizers according to requirements in other Specification Sections.
- B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.
- C. Proceed with placement only after unsatisfactory conditions have been corrected.
- D. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff of airborne dust to adjacent properties and walkways.



### 3.2 PLACING AND MIXING PLANTING SOIL OVER EXPOSED SUBGRADE

- A. General: Apply and mix unamended soil with amendments on-site to produce required planting soil, or apply manufactured soil on site in its final, blended condition. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Subgrade Preparation: Till subgrade to a minimum depth of 4 inches. Remove stones larger than 1-1/2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
  - 1. Apply, add soil amendments, and mix approximately half the thickness of unamended soil over prepared, loosened subgrade according to "Mixing" Paragraph below. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil.
- C. Mixing: Spread unamended soil to total depth indicated on Drawings, but not less than required to meet finish grades after mixing with amendments and natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.
  - 1. Amendments: Apply soil amendments and fertilizer, if required, evenly on surface, and thoroughly blend them with unamended soil to produce planting soil.
    - a. Mix lime and sulfur with dry soil before mixing fertilizer.
    - b. Mix fertilizer with planting soil no more than seven days before planting.
  - 2. Lifts: Apply and mix unamended soil and amendments in lifts not exceeding 8 inches in loose depth for material compacted by compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- D. Compaction: Compact each blended lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D698.
- E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

### 3.3 PLACING STRUCTURAL SOIL OVER EXPOSED SUBGRADE

- A. Testing:
  - 1. All CU-Structural Soil mixing shall be performed at the licensed producer's yard using appropriate soil measuring, mixing and shredding equipment of sufficient capacity and capability to assure proper quality control and consistent mix ratios. No mixing of CU-Structural Soil at the project site shall be permitted.
  - 2. Maintain adequate moisture content during the mixing process. Soils and mix components shall easily shred and break down without clumping. Soil clods shall easily break down into a fine crumbly texture. Soils shall not be overly wet or dry. The licensed producer shall measure and monitor the amount of soil moisture at the mixing site periodically during the mixing process.
  - 3. Raw materials shall be mixed off-site, only at the licensed producer's facility, on a flat asphalt or concrete paved surface to avoid soil contamination.
  - 4. Should the independent laboratory test results of the clay loam reveal a need to amend it, to meet specifications, the amending materials should be added to the clay loam following

the rates and recommendations provided by the Soil Analysis and for the specific plants specified on the Plant Schedule.

B. Underground Utilities and Subsurface Conditions

1. The installing contractor shall notify the Landscape Architect of any subsurface conditions which will affect the contractor's ability to install the CU-Structural Soil.
2. The installing contractor shall locate and confirm the location of all underground utility lines and structures prior to the start of any excavation.
3. The installing contractor shall repair any underground utilities or foundations damaged during the progress of this work.

C. Site Preparation

1. Do not proceed with the installation of the CU-Structural Soil material until all walls, curb footings and utility work in the area have been installed. For site elements dependent on CU-Structural Soil<sup>®</sup> for foundation support, postpone installation of such elements until immediately after the installation of CU-Structural Soil.
2. Install subsurface drain lines as shown on the plan drawings prior to installation of CU-Structural Soil material.
3. Excavate and compact the proposed subgrade to depths, slopes and widths as shown on the drawings. Maintain all required angles of repose of the adjacent materials as shown on the drawings. Do not over excavate compacted subgrades of adjacent pavement or structures.
4. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope parallel to the finished grade and/or toward the subsurface drain lines as shown on the drawings.
5. Clear the excavation of all construction debris, trash, rubble and any foreign material. In the event that fuels, oils, concrete washout silts or other material harmful to plants have been spilled into the subgrade material, excavate the soil sufficiently to remove the harmful material. Fill any over excavation with approved fill and compact to the required subgrade compaction.
6. Do not proceed with the installation of CU-Structural Soil until all utility work in the area has been installed. All subsurface drainage systems shall be operational prior to installation of CU-Structural Soil.
7. Protect adjacent walls, walks and utilities from damage. Use ½" plywood and/or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work.
  - a. Clean up all trash and any soil or dirt spilled on any paved surface at the end of each working day.
  - b. Any damage to the paving or architectural work caused by the installing contractor shall be repaired, as directed by the Landscape Architect.
8. Maintain all silt and sediment control devices required by applicable regulations.
9. Provide adequate methods to assure that trucks and other equipment do not track soil from the site onto adjacent property and the public right of way.

D. Installation of CU-Structural Soil Material

1. Install CU-Structural Soil in 6-inch lifts and compact each lift.
2. Compact all materials to at least 95% Proctor Density from a standard compaction curve AASHTO T 99 (ASTM D 698). No compaction shall occur when moisture content exceeds maximum as listed herein. Delay compaction if moisture content exceeds maximum

allowable and protect CU-Structural Soil during delays in compaction with plastic or plywood as directed by the Landscape Architect.

3. Bring CU-Structural Soil to finished grades as shown on the drawings. Immediately protect the CU-Structural Soil from contamination by toxic materials, trash, debris, water containing cement, clay, silt or materials that will alter the particle size distribution of the mix with plastic or plywood as directed by the Landscape Architect.
4. The Landscape Architect may periodically check the material being delivered, prior to installation for color and texture consistency with the approved sample provided by the installing contractor as part of the submittal for CU-Structural Soil. If the Landscape Architect determines that the delivered CU-Structural Soil varies significantly from the approved samples, the Landscape Architect shall contact the licensed producer.
5. Contractor shall maintain weight tickets showing source of material. Landscape Architect may review at its discretion that the delivered structural soil was produced by the approved CU-Structural Soil licensee by inspecting weight tickets showing source of material. If tickets are not provided or installed soil is found to be non-compliant, it shall be removed by the Contractor and replaced with approved soil material at no additional cost to Owner.
6. CU-Structural Soil should not be stockpiled long-term. Any CU-Structural Soil not installed immediately should be protected by a tarp or other waterproof covering.

E. Fine Grading

1. After the initial placement and rough grading of the CU-Structural Soil but prior to the start of fine grading, the installing contractor shall request review of the rough grading by the Landscape Architect. The installing contractor shall set sufficient grade stakes for checking the finished grades.
2. Adjust the finish grades to meet field conditions as directed. Provide smooth transitions between slopes of different gradients and direction. Fill all dips with CU-Structural Soil and remove any bumps in the overall plane of the slope.
  - a. The tolerance for dips and bumps in CU-Structural Soil areas shall be a 3” deviation from the Drawings.
3. All other fine grading shall be inspected and approved by the Landscape Architect prior to the installation of other items to be placed on the CU-Structural Soil.

F. Acceptance Standards

1. The Landscape Architect will inspect the work upon the request of the installing contractor. Request for inspection shall be received by the Landscape Architect at least 10 days before the anticipated date of inspection.

G. Clean Up

1. Upon completion of the CU-Structural Soil installation operations, clean areas within the contract limits. Remove all excess fills, soils and mix stockpiles and legally dispose of all waste materials, trash and debris. Remove all tools and equipment and provide a clean, clear site. Sweep, do not wash, all paving and other exposed surfaces of dirt and mud until the paving has been installed over the CU-Structural Soil material. Do no washing until finished materials covering CU-Structural Soil material are in place.

### 3.4 PROTECTION

- A. Protection Zone: Identify protection zones as indicated on Drawings.

- B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:
  - 1. Storage of construction materials, debris, or excavated material.
  - 2. Parking vehicles or equipment.
  - 3. Vehicle traffic.
  - 4. Foot traffic.
  - 5. Erection of sheds or structures.
  - 6. Impoundment of water.
  - 7. Excavation or other digging unless otherwise indicated.
  
- C. If planting soil or subgrade is over-compacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the planting soil and contamination; restore the subgrade as directed by Landscape Architect and replace contaminated planting soil with new planting soil.

### 3.5 CLEANING

- A. Protect areas adjacent to planting-soil preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.
  
- B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.
  - 1. Legally dispose of excess subsoil and unsuitable materials off-site.

END OF SECTION 329113

**SECTION 329200  
TURF AND GRASSES**

**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. Seeding.
  - 2. Turf renovation.
  - 3. Erosion control materials.
- B. Related Requirements:
  - 1. Section 329113 "Soil Preparation" for information regarding planting soils.
  - 2. Section 329300 "Plants" for trees, shrubs, ground covers, and other plants.

**1.3 DEFINITIONS**

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- C. Planting Soil: Imported soil or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329113 "Soil Preparation" and drawing designations for planting soils.
- D. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

**1.4 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Ziehler Playground, 200-64 E. Olney Avenue, Philadelphia, PA 19120.

## 1.5 ACTION SUBMITTALS

- A. Planting & Installation Schedule: Submit proposed planting and installation schedule, indicating dates for completion of work items, soil testing, , and installation of each type of turfgrass during normal seasons for such work in area of site.
  - 1. Correlate Plant & Installation Schedule with specified maintenance periods to provide maintenance from date of Substantial Completion. Once accepted, revise dates only as approved in writing, after documentation of reasons for delays.
  - 2. Submit letter notifying Owner and Landscape Architect of completion of planting work and requesting inspection to determine acceptability for Substantial Completion and beginning of Warranty Period.
  - 3. Submit letter to Owner and Landscape Architect requesting a final inspection of planting work for Final Acceptance at end of Warranty Period.
  
- B. Turf Maintenance Schedule: Submit proposed turf maintenance schedule, indicating frequency of maintenance visits and scheduled maintenance activities to occur during visits.
  - 1. Plant maintenance shall include watering of plants. Loss of turf due to inadequate watering will be considered negligence of maintenance services and will require replacement at no cost to Owner.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For landscape Installer.
  
- B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
  - 1. Certification of each seed mixture for turfgrass seed. Include identification of source and name and telephone number of supplier.
  
- C. Product Certificates: For fertilizers, from manufacturer.
  
- D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

## 1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required maintenance periods.

## 1.8 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.

1. Professional Membership: Installer shall be a member in good standing of either the National Association of Landscape Professionals or AmericanHort.
2. Experience: Engage an experienced Installer who has completed turf installation to the extent indicated for this Project and with a record of successful lawn establishment for a minimum of three (3) years.
3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
4. Pesticide Applicator: State-licensed, commercial.

#### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.
- B. Bulk Materials:
  1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
  2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
  3. Accompany each delivery of bulk materials with appropriate certificates.

#### 1.10 FIELD CONDITIONS

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.
  1. Spring Planting: March 15 – June 15
  2. Fall Planting: September 1 – November 15
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

#### 1.11 MAINTENANCE SERVICE

- A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established but not for less than the following periods:
  1. Seeded Turf: Ninety (90) days from date of Substantial Completion.
    - a. When initial maintenance period has not elapsed before end of planting season, or turf is not fully established, continue maintenance during next planting season.
- B. When initial maintenance period has not elapsed before end of planting season, or turf is not fully established, continue maintenance during next planting season.

PART 2 - PRODUCTS

2.1 TURFGRASS SEED

- A. Turfgrass Seed: Certified, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture that is strongly rooted and capable of vigorous growth and development when planted.
- B. Turfgrass Species, Cool-Season Grass: Sod of grass species as follows, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:

Seed Type	Proportion by Weight	Minimum Purity	Minimum Germination
Turf-Type Tall Fescue (3 Varieties Min.)	60%	95%	80%
Perennial Rye Grass	30%	95%	85%
Kentucky Bluegrass	10%	90%	80%

2.2 FERTILIZERS

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
  - 1. Composition:
    - a. Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
- B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
  - 1. Composition:
    - a. Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.3 PLANTING SOIL

- A. See Section 323913 "Soil Preparation."

2.4 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.



## 2.5 PESTICIDES

- A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

## 2.6 EROSION-CONTROL MATERIALS

- A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.
  - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
  - 2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
  - 3. Uniformly moisten excessively dry soil that is not workable, or which is dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

### 3.2 PREPARATION

- A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
  - 1. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

### 3.3 TURF AREA PREPARATION

- A. General: Prepare planting area for soil placement and mix planting soil according to Section 32911 "Soil Preparation."
- B. Newly Graded Subgrades: Loosed subgrade to a minimum depth of 8 inches. Remove stones larger than 1 1/2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
  - 1. Spread planting soil to a depth of 6 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
- C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2-inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
- D. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- E. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

### 3.4 PREPARATION FOR EROSION-CONTROL MATERIALS

- A. Prepare area as specified in "Turf Area Preparation" Article.
- B. For erosion-control blanket, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.
- C. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

### 3.5 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph.
  - 1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
  - 2. Do not use wet seed or seed that is moldy or otherwise damaged.
  - 3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- B. Sow seed at rate recommended by seed supplier.
- C. Rake seed lightly into top 1/8-inch of soil, roll lightly, and water with fine spray.

- D. Protect seeded areas with slopes exceeding 1:4 with erosion-control blankets installed and stapled according to manufacturer's written instructions.
- E. Protect seeded areas with slopes between 1:6 and 1:4 with erosion control fiber mesh installed and stapled to manufacturer's written instructions.
- F. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
  - 1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
- G. Protect seeded areas from hot, dry weather or drying winds by applying compost mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch (4.8 mm), and roll surface smooth.

### 3.6 TURF RENOVATION

- A. Renovate existing turf where indicated or where existing turf is damaged due to construction activities.
- B. Renovate turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
  - 1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
  - 2. Install new planting soil as required.
- C. Remove sod and/or seed and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.
- D. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.
- E. Mow, dethatch, core aerate, and rake existing turf.
- F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.
- H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.
- I. Apply soil amendments and initial fertilizer required for establishing new turf and mix thoroughly into top 4-inches of existing soil. Install new planting soil to fill low spots and meet finish grades.
  - 1. Soil Amendment(s): Apply soil amendment(s) according to requirements of Section 329113 "Soil Preparation."
  - 2. Initial Fertilizer: Slow-release fertilizer applied according to manufacturer's recommendations.

- J. Apply seed and protect with straw mulch and sod as required for new turf.
- K. Water newly planted areas and keep moist until new turf is established.

### 3.7 TURF MAINTENANCE

- A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
  - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
  - 2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
  - 3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Install and maintain temporary piping, hoses, and/or turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.
  - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
  - 2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.
- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
  - 1. Mow installed sod to a height of 2 to 2 1/2 inches.
- D. Turf Postfertilization: Apply slow-release fertilizer after initial mowing and when grass is dry.
  - 1. Use fertilizer that provides actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.

### 3.8 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Landscape Architect:
  - 1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
- B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

### 3.9 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

### 3.10 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.
- C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- D. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION 329200

**SECTION 329300  
PLANTS**

**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. Trees (Canopy and Understory).
  - 2. Shrubs.
  - 3. Herbaceous Plants (Ornamental Grasses, Perennials, and Groundcovers).
  - 4. Fertilizers.
  - 5. Mulches.
  - 6. Tree Watering Bags.
- B. Related Requirements:
  - 1. Section 323300 "Site Furnishings" for tree grates.
  - 2. Section 329113 "Soil Preparation" for information regarding planting and structural soils.
  - 3. Section 329200 "Turf and Grasses" for turf (lawn).

**1.3 REFERENCES**

- A. American National Standards Institute (ANSI):
  - 1. Z60.1 – American Standards for Nursery Stock
  - 2. A300 – Standards for Tree Care Operations
- B. United States Department of Agriculture (USDA):
  - 1. Plant Hardiness Zone Map
- C. American Society for Testing and Materials (ASTM) Standards as listed in Specification.

**1.4 DEFINITIONS**

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with a ball size not less than sizes indicated; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

- C. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.
- D. Finish Grade: Elevation of finished surface of planting soil.
- E. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- F. Planting Area: Areas to be planted.
- G. Planting Soil: Imported soil or manufactured soil that has been modified with soil amendments and/or fertilizers to produce a soil mixture best for plant growth. See Section 329115 "Soil Preparation (Performance Specification)" for drawing designations for planting soils.
- H. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- I. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
- J. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
- K. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

## 1.5 COORDINATION

- A. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.
  - 1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

## 1.6 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Ziehler Playground, 200-64 E. Olney Avenue, Philadelphia, PA 19120.

## 1.7 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Plant Materials: Contractor shall provide a confirmed Plant Schedule verifying quantities, sizes, quality, and sources for all specified plant materials.

- a. Contractor shall provide confirmed Plant Schedule to Landscape Architect a minimum of six (6) weeks prior to anticipated Plant Installation.
    2. Plant Photographs: For plant material not tagged in field by Landscape Architect, include color photographs in digital format of each required species and size of plant material as it will be furnished to Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than 10 plants are required, include a minimum of three photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.
      - a. Landscape Architect reserves the right to reject plant material based on photographs that do not meet specification requirements or appear damaged, diseased, or otherwise unhealthy.
  - B. Samples for Verification: For each of the following:
    1. Plant Material: Bill of sale indicating full scientific name, quantity, plant size, and name of growing nursery for all plant material.
    2. Organic and Compost Mulch: 1-quart (1-L) volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
  - C. Planting & Installation Schedule: Submit proposed planting and installation schedule, indicating dates for completion of work items, plant tagging, soil testing, digging of woody plants, and installation of each type of landscape work during normal seasons for such work in area of site.
    1. Correlate Plant & Installation Schedule with specified maintenance periods to provide maintenance from date of Substantial Completion. Once accepted, revise dates only as approved in writing, after documentation of reasons for delays.
    2. Submit letter notifying Owner and Landscape Architect of completion of planting work and requesting inspection to determine acceptability for Substantial Completion and beginning of Warranty Period.
    3. Submit letter to Owner and Landscape Architect requesting a final inspection of planting work for Final Acceptance at end of Warranty Period.
  - D. Plant Maintenance Schedule: Submit proposed plant maintenance schedule, indicating frequency of maintenance visits and scheduled maintenance activities to occur during visits.
    1. Plant maintenance shall include watering of plants. Loss of plants due to inadequate watering will be considered negligence of maintenance services and will require plant replacement at no cost to Owner.
    2. A one-year watering plan shall be submitted as part of Plant Maintenance Schedule.
- 1.8 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
  - B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:



1. Manufacturer's certified analysis of standard products.
  2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
- C. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.
- D. Sample Warranty: For special warranty.

#### 1.9 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before expiration of required maintenance periods.

#### 1.10 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.
1. Professional Membership: Installer shall be a member in good standing of either the National Association of Landscape Professionals or AmericanHort.
  2. Experience: Engage an experienced Installer who has completed planting work similar in material, design, and extent to that indicated for this Project and with a record of successful plant establishment for a minimum of three (3) years.
  3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
  4. Pesticide Applicator: State-licensed, commercial.
- B. Nursery Qualifications: A nursery specializing in growing and cultivating the plant specified in this Section with a minimum of six (6) years' experience.
1. Nurseries shall be members of the American Association of Nurserymen and Pennsylvania Landscape and Nurserymen's Association, or equivalent State organization(s).
  2. Nurseries shall be within same plant hardiness zone and having similar climate conditions as Project Site. Zone shall be as defined on United States Department of Agriculture Plant Hardiness Zone Map.
    - a. Nursery shall be located within 75-miles of Project site. Plant sources greater than this distance will not be accepted without written approval by Landscape Architect.
- C. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
- D. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container-grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.
  2. Other Plants: Measure with stems, petioles, and foliage in their normal position.

- E. Plant Material Observation: Landscape Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality.
  - 1. Landscape Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.
  - 2. Notify Landscape Architect of sources of planting materials at least seven days in advance of delivery to site.
- F. Substitutions: Substitutions will only be considered after review of plant availability with Landscape Architect. Submit request for substitutions in writing to Landscape Architect. **Substitutions will only be accepted with written approval by Landscape Architect.**

#### 1.11 HARVESTING, DELIVERY, STORAGE, AND HANDLING

- A. Tree Tagging: Landscape Architect may accompany Contractor to nursery to select and tag trees. Landscape Architect may choose to select and tag shrubs.
  - 1. Landscape Architect shall select plants for proper visual formation. Contractor shall inspect selected plants for disease and other requirements of Contract Documents. Prior to nursery trip, Contractor shall have pre-selected Nursery(s) to ascertain the sufficient plants in size and species required, and provided the confirmed Plant Schedule to Landscape Architect.
  - 2. The Landscape Architect may tag trees and shrubs of each species as a representative sample. Trees and shrubs delivered to the Project site without tags, and shrubs that do not equally match the quality of tagged samples, shall be rejected.
- B. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.
- C. Bulk Materials:
  - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
  - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
  - 3. Accompany each delivery of bulk materials with appropriate certificates.
- D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- E. Handle planting stock by root ball.
- F. The Contractor must verify that one of the following methods is used to protect plant material in transit:

1. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.
    - a. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.
  2. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.
- G. Deliver plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
  2. Do not remove container-grown stock from containers before time of planting.
  3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.
- H. All plant material must have labels showing botanical name on each individual plant. Plants without labels will be rejected by Landscape Architect and shall be removed immediately from the Project Site.**
- I. Notify the Landscape Architect at least three (3) business days in advance of start of Work.
- J. The Landscape Architect reserves the right to reject plant materials not meeting the above requirements.

#### 1.12 FIELD CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work. Hand excavate, as required. Maintain grade stakes until parties concerned mutually agree upon removal.
- B. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
1. Spring Planting: March 15 – June 15
  2. Fall Planting: September 1 – November 15
  3. Planting outside of designated timeframes above may only occur with written approval from Landscape Architect.
  4. Planting between June 16 to August 31 is not permitted.
- C. Plant trees after finished grades are established and before planting lawns, unless approved otherwise by Landscape Architect.
1. When planting trees after lawn, protect lawn areas and promptly repair damage caused by planting operations.

- D. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.
- E. Utilities: Determine location of above-grade and underground utilities and perform Work in a manner which will avoid damage. Hand excavate, as required. Maintain grade stakes until parties concerned mutually agree upon removal.
  - 1. Notify Owner no fewer than three (3) days in advance of proposed interruption of each service or utility.
  - 2. Do not proceed with interruption of services or utilities without Owner's written permission.
- F. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or other obstructions, notify Landscape Architect before planting.

#### 1.13 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Death and unsatisfactory growth, including resulting from lack of adequate maintenance during warranty period.
    - b. Structural failures including plantings falling or blowing over.
    - c. Faulty performance of tree stabilization edgings and tree grates.
    - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 2. Warranty Periods: From date of Substantial Completion and acceptance of Work by Owner.
    - a. Trees, Shrubs, Vines, and Ornamental Grasses: Twelve (12) months.
    - b. Ground Covers, Biennials, Perennials, and Other Plants: Twelve (12) months.
  - 3. Include the following remedial actions as a minimum:
    - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
    - b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
    - c. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.
    - d. Provide extended warranty for period equal to original warranty period, for replaced plant material.
    - e. At end of Warranty Period, cut bindings around base of trunks and remove loose materials. Redistribute, add, and/or replace mulch as needed.

#### 1.14 MAINTENANCE SERVICE

- A. Initial Maintenance Service for Plant Material. Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants

are installed and continue until plantings are acceptable healthy and well-established but not for less than maintenance period below:

1. Maintenance Period for Trees and Shrubs: Twelve (12) months.
2. Ground Covers, Perennials, Ornamental Grasses, and Other Plans: Twelve (12) months.

## PART 2 - PRODUCTS

### 2.1 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots are unacceptable and will be rejected and shall be removed from the project site immediately.
  2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
  3. Acquire plants from nurseries within 100-mile radius of Project Site. Plant sources greater than this distance will not be accepted without written approval from Landscape Architect.
- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Landscape Architect, with a proportionate increase in size of roots or balls.
- C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
- D. Labeling: Label each plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant.
1. Plants without labels will be rejected by Landscape Architect and shall be removed immediately from the Project Site.

### 2.2 TREES

- A. Provided balled and burlapped trees, unless container-grown trees are specified on Plant Schedule.
- B. Canopy Trees: Provide canopy trees with well-balanced crowns, straight trunks with intact main leaders, undamaged and uncut, and of height and caliper indicated on Plant Schedule, and conforming to ANSI Z60.1.

1. Tree sizes and conditions shall meet or exceed requirements as specified on Plant Schedule. Contractor may elect to provide trees with larger caliper than specified at no additional cost to Owner.

C. Understory Trees: Provide understory trees that are upright and spreading, branched naturally according to species and type, and of height and container size indicated on Plant Schedule, and conforming to ANSI Z60.1.

1. Understory trees shall have two to three main stems. Understory trees with four or more main stems may be rejected upon inspection by Landscape Architect.

## 2.3 SHRUBS

A. Provide deciduous shrubs with not less than the minimum number of canes required by and measured according to ANSI Z60.1 for type, shape, and height of shrub. See Plant Schedule.

## 2.4 HERBACEOUS PLANTS

A. Provide ornamental grasses, perennials, and groundcovers that are established and well-rooted in removable containers or integral pots and with not less than the minimum number and length of runners required by ANSI Z60.1 for the pot size indicated. See Plant Schedule.

## 2.5 FERTILIZERS

A. Feeder Packs: Organic, biodegradable packs containing a measured dose of fertilizer (4-2-2), mycorrhizae, biochar, azomite, and micronized oyster shell (5% calcium and 1% Sulphur).

1. *Fuhgeddaboudit!* Root Zone Feeder Packs, manufactured by Organic Mechanics Soil Company, LLC  
P.O. Box 272, Modena, PA 19358  
Phone: 610-380-4598  
[www.organicmechanicsoil.com](http://www.organicmechanicsoil.com)

## 2.6 PLANTING SOIL

A. See Section 323913 "Soil Preparation."

## 2.7 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of the following:

1. Type: Triple-Shredded hardwood bark.
2. Size Range: 3-inch maximum, 1/2-inch minimum.
3. Color: Natural and undyed.

B. Leaf Litter: Chopped or shredded leaves, free of weeds, seeds, loam, sand, clay, and other foreign substances. Acquire leaf litter locally from a source approved by Landscape Architect.

## 2.8 PESTICIDES

- A. General: Pesticide registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

## 2.9 TREE-WATERING BAGS

- A. Slow-Release Watering Bags: Standard product manufactured for drip irrigation of plants and emptying its water contents over an extended time period; manufactured from UV-light-stabilized nylon-reinforced polyethylene sheet, PVC, or HDPE plastic. Obtain from source below or approved equal.
  - 1. Tregator Original, manufactured by Spectrum Products, Inc.  
153 Mosswood Boulevard, Youngsville, NC 27596  
Phone: 1-866-873-3428  
[www.tregator.com](http://www.tregator.com)

## 2.10 MISCELLANEOUS PRODUCTS

- A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.
- B. Burlap: Non-synthetic, biodegradable.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.
  - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
  - 2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
  - 3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
  - 4. Uniformly moisten excessively dry soil that is not workable or which is dusty.

- B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Landscape Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

### 3.3 PLANTING AREA ESTABLISHMENT

- A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation ."
- B. Placing Planting Soil: Place and mix planting soil in-place over exposed subgrade.
- C. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.
- D. Around Existing Trees:
  - 1. Loosen existing soil surface by hand to a depth required to plant shrubs and / or herbaceous plants.
  - 2. Do not place more than 10" of planting soil under dripline of existing trees.
  - 3. Spread two-inch deep layer of compost over soil. Mix thoroughly into top six inches of soil. Excavate and remove existing soil as required to maintain existing grades of landscape beds.
- E. Newly Graded Subgrades:
  - 1. Loosen compacted subgrade with a subsoil ripping tool to a depth of 18-inches and with vertical trenches 24-inches apart. Run subsoil-ripping tool in two directions at right angles to each other.
  - 2. Spread 2-inch deep layer of topsoil or planting mix over loosened subgrade. Mix thoroughly into top 4-inches of subgrade.
  - 3. Spread topsoil or planting mix to depths indicated, but not less than required, to meet finish grades after addition of amendments, light rolling, and natural settlement. Do not spread if topsoil or subgrade is frozen, muddy, or excessively wet. Apply soil amendments and fertilizer on surface and mix thoroughly into topsoil.
  - 4. Spread 2-inch deep layer of compost over topsoil. Mix thoroughly into top 6-inches of soil.



5. After light rolling and settlement, compact in 6-inch lifts and compact to 85% of maximum dry weight according to ASTM D698, to depth required to meet grades and elevations as indicated on Drawings.
- F. Finish Grade: Grade planting beds to a smooth, even surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
  1. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.
- G. Stage installation of topsoil or planting mix to avoid travel by equipment over placed topsoil or planting mix.
- H. Restore planting beds if eroded or otherwise disturbed

### 3.4 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits.
  1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. Scarify subgrade 2-inches, and trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Scarify sides of planting pit smeared or smoothed during excavation.
  2. Excavate approximately three times as wide as ball diameter for balled and burlapped and container-grown stock.
  3. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
  4. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
  5. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
  6. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
  7. Maintain supervision of excavations during working hours.
  8. Keep excavations covered or otherwise protected after working hours or when unattended by Installer's personnel.
- B. Obstructions: Notify Landscape Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
- C. Drainage: Notify Landscape Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

### 3.5 TREE AND SHRUB PLANTING

- A. Inspection: At time of planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.

- B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with top of root ball at same elevation relative to ground level as in the nursery.
  - 1. If soil is dry, moisten prepared planting areas before planting. Do not create muddy soil conditions.
  - 2. Backfill: Approved planting soil.
  - 3. Do not remove burlap from balls. After placing some backfill around root ball to stabilize plant, carefully cut and remove rope and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
  - 4. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
  - 5. Place fertilizer feeder packs equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball per manufacturer's instructions.
    - a. Quantity: Three (3) per canopy and understory tree.
  - 6. Continue backfilling process. Water again after placing and tamping final layer of soil.
- D. Container-Grown Stock: Set each plant plumb and in center of planting pit or trench with top of root ball level with adjacent finish grades of planting soil.
  - 1. Backfill: Approved planting soil.
  - 2. Carefully remove root ball from container without damaging root ball or plant.
  - 3. Cut pot bound roots to prevent future root girdling.
  - 4. Place stock on setting layer of compacted planting soil.
  - 5. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
  - 6. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball per manufacturer's instructions.
    - a. Quantity: One (1) per shrub.
  - 7. Continue backfilling process. Water again after placing and tamping final layer of soil.
- E. Slopes: When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.
- F. Install CU-Structural Soil in areas identified on the Drawings as indicated in Section 329113 – "Soil Preparation."

### 3.6 TREE AND SHRUB PRUNING

- A. Remove only dead, dying, or broken branches. Do not prune otherwise unless directed by Landscape Architect
- B. Do not cut tree leaders unless directed by Landscape Architect.

- C. Do not apply pruning paint to wounds.

### 3.7 HERBACEOUS PLANT PLANTING

- A. Set out and space ground cover and plants other than trees and shrubs as indicated on Drawings in even rows with triangular spacing. Do not remove plants from containers until immediately before planting.
- B. Use approved planting soil for backfill.
- C. Dig holes large enough to allow spreading of roots.
- D. Immediately before setting plants, dip plant rootball into solution of root dip gel and water as recommended by manufacturer.
- E. For rooted cutting plants supplied in flats, plant each in a manner that minimally disturbs the root system but to a depth not less than two nodes.
- F. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- G. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- H. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

### 3.8 PLANTING AREA MULCHING

- A. Mulch backfilled surfaces of planting areas and other areas indicated.
  1. Trees in Turf Areas: Apply organic mulch ring of 1-1/2" thick layer of leaf litter, followed by 1-1/2" thick layer of triple-shredded hardwood mulch on top of leaf litter layer, with 18-inch radius around trunks or stems. Do not place mulch within 3 inches of trunks or stems.
  2. Planting Areas: Apply 1-1/2" thick layer of leaf litter, followed by 1-1/2" thick layer of triple-shredded hardwood mulch on top of leaf litter layer, over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.

### 3.9 INSTALLATION OF TREE GRATES

- A. Tree Grates: Install according to manufacturer's written instructions. Set grate segments flush with adjoining surfaces. Shim from supporting substrate with soil-resistant plastic. Casting shall contain 18" tree opening upon installation.

### 3.10 INSTALLATION OF TREE WATERING BAGS

- A. Provide one device for each tree.

- B. Place device on top of the mulch at base of tree stem and fill with water according to manufacturer's written instructions.

### 3.11 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.
- B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.
- D. Plant maintenance shall include watering of plants. Loss of plants due to inadequate watering will be considered negligence of maintenance services and will require plant replacement at no cost to Owner. A one-year watering plan shall be submitted as part of Plant Submittals.
  - 1. Install and maintain temporary drip irrigation piping and hoses to convey water from sources to planting areas and to keep plantings uniformly moist.
- E. Fertilize trees approximately one year after installation between October and December, or between February and April. Unless otherwise indicated by soil test results, apply at a rate of 2 pounds of actual nitrogen per 1,000 square feet. Make insertion points approximately 2'-6" apart, at a depth of 6 inches. Apply fertilized in the ball and backfill area, and to approximately 1 foot outside of the planting hole.\

### 3.12 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Pre-Emergent Herbicides (Selective and Nonselective): Apply to tree, shrub, and ground-cover areas according to manufacturer's written recommendations. Do not apply to seeded areas.
- C. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

### 3.13 REPAIR AND REPLACEMENT

- A. General: Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Landscape Architect.
  - 1. Submit details of proposed pruning and repairs.

2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Landscape Architect.

- B. Remove and replace trees that are more than 25 percent dead or in an unhealthy condition or are damaged during construction operations that Landscape Architect determines are incapable of restoring to normal growth pattern.
  1. Provide new trees of same size and species as those being replaced for each tree unless otherwise directed by Landscape Architect.

### 3.14 CLEANING AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.
- C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- D. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.
- E. At time of Substantial Completion, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

### 3.15 FINAL INSPECTION

- A. Inspection to determine completion and acceptance of planted areas will be made by the Landscape Architect, upon Contractor's request. Provide notification at least ten (10) business days before requested inspection date. Inspection comments will be submitted to the Contractor in writing.
- B. Planted areas will be accepted provided all requirements, including the maintenance period have been complied with and plant materials are alive and in a healthy, vigorous condition.
- C. Upon acceptance of Work, the Owner will assume plant maintenance and the plant material Warranty period will begin.
- D. An additional inspection will be made near the end of the Warranty period to determine if plant materials need to be replaced. Plants shall be in a health, vigorous growing state and free of disease and insects.

END OF SECTION 329300

**BID NO.** \_\_\_\_\_

PREQUAL BID #

ACTUAL BID #

2022

City of Philadelphia

Water Department

-----  
**WORK NO. S-50329-G**  
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BIDDING REQUIREMENTS, CONTRACT FORMS

and

SPECIAL SPECIFICATIONS

for

CONSTRUCTION OF GREEN STORMWATER INFRASTRUCTURE

in

E OLNEY AVE FROM EDGE OF PROPERTY TO "B" STREET

"B" STREET FROM CLARKSON AVE TO E OLNEY AVE

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ATTACHED

-----	Appendix A – Maintenance of Traffic Requirements
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-----	Appendix H – Spare Parts Delivery List
-----	Appendix L – Landscaping Qualifications Form
-----	Appendix M – Monthly Planting Project Status Report
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SECTION 02161  
SHEETING AND SHORING

PART 1 GENERAL

1.01 SYSTEM DESCRIPTION

- A. Sheeting and shoring (where required) shall be of sufficient strength to resist all external pressures. It shall prevent settlement of adjacent buildings and underground structures.
- B. Definitions:
  - 1. Cutoff Line: a plane two feet below street surface or finished grade.
  - 2. Sheeting and Shoring: a temporary structure including sheeting, sheet piling, lagging, shoring, walers, strongbacks, soldier beams, and/or other members to maintain walls of excavation during construction.

1.02 REFERENCE STANDARDS

- A. Conform to Philadelphia Water Department Standard Specifications for Excavation, Refilling, Grading, Landscaping and Repaving, and to all applicable City, State, and Federal laws and regulations.

1.03 SUBMITTALS

- A. For all sheeting and shoring (except sheeting and shoring for trenches and excavations less than ten feet deep to invert) submit plans and calculations prepared by a registered Professional Engineer. Show size and arrangement of all members, and indicate materials to be used. State assumed loads, including any railroad loads, soil strata, and groundwater levels.

1.04 MEASUREMENT AND PAYMENT

- A. Sheeting and shoring for sewer and water piping (to be left in place), shall be paid at the fixed price of twelve hundred dollars (\$1200) per thousand board feet (MBM). The fixed price includes the following and all appurtenant work and materials: furnishing, placing, maintaining, and cutting off timber sheeting and shoring; removing and disposing of debris. Sheeting and shoring removed from water and sewer trenches shall not be measured for payment.
- B. Sheeting and shoring for green stormwater infrastructure systems (to be fully removed) shall be included as part of the lump sum cost. The bid price shall include provision and installation of all sheeting and shoring materials, maintenance of emplaced sheeting and shoring during construction, removal of all sheeting materials in full, and any and all appurtenant labor and materials.
- C. The Contractor shall use a method of sheeting and shoring sufficient in strength to resist all external pressure so as to maintain the walls of the trench during construction. The method used including, but not limited to, sheeting, sheet piling, lagging, shoring, walers, strongbacks, and steel soldier beams, will be included in the price bid.
- D. Regardless of the sheeting and shoring method used, the paving restoration and excavation outside the limits of payment defined for excavation is incidental. There will be no separate or additional payment for paving beyond these limits.



- E. The Contingency cost of all work and materials for Sheeting and Shoring not incidental to other proposal items will be paid for at the fixed price of twelve hundred dollars (\$1200) per thousand feet board measure for sheeting and shoring, which price shall be full payment for all such costs.
- F. No additional payment will be made for sheeting and shoring removal from stormwater management structures. Removal of sheeting and shoring will be included in the bid price for excavation where necessary. All sheeting and shoring (to full depth) shall be removed from stormwater management structures.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION

3.01 GENERAL INSTALLATION

- A. Place continuous close sheeting and shoring along entire trench, in accordance with Contract Documents and approved plans and calculations.
- B. In trenches external to stormwater systems, when backfilling has progressed to one foot below Cutoff Line remove all sheeting and shoring above Cutoff Line.
- C. Remove all sheeting and shoring entirely from stormwater system trenches as it becomes safe to do so, or upon final backfilling of the trench. Additional backfilling and compaction to maintain stability shall be employed as necessary to fill voids created by support structure removal.

END OF SECTION

SECTION 02370  
GEOSYNTHETICS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The work of this Section includes provision and installation of geosynthetic materials for separation, reinforcement or drainage control.
  - 1. All materials shall be manufactured, supplied, stored and placed according to the latest referenced standards and as outlined herein.
  - 2. The Contractor shall provide certification of the supplied material.
  - 3. The materials shall be placed to the limits as specified in accordance with the manufacturer's instructions and as specified herein.

1.02 RELATED SECTIONS

- A. Section 02135 Erosion and Sediment Control
- B. Section 02210 Earthwork
- C. Section 02709 Subsurface Stormwater Storage
- D. Section 02720 Stormwater Surface Features
- E. Section 02830 Green Stormwater Infrastructure Soils

1.03 REFERENCE STANDARDS

- A. ASTM International - Geotextiles
  - 1. ASTM D3786 - Standard Test for Mullen Burst Strength
  - 2. ASTM D4355 - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc-Type Apparatus
  - 3. ASTM D4491 - Standard Test for Water Permeability
  - 4. ASTM D4632 - Standard Test for Grab Tensile Strength
  - 5. ASTM D4533 - Standard Test for Tear Resistance
  - 6. ASTM D4833 - Standard Test for Puncture Resistance
  - 7. ASTM D4873 – Standard Guide for Identification, Storage and Handling of Geosynthetics
  - 8. ASTM D4751 - Standard Test for Apparent Opening Size (AOS)
  - 9. ASTM D6241 - Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe
- B. ASTM International – Geomembranes-HDPE
  - 1. ASTM D1603 - Standard Test for Carbon Black Content in Olefin Plastics
  - 2. ASTM D4218 - Standard Test for Carbon Black Content in Polyethylene Compounds
  - 3. ASTM D5596 - Standard Test for Carbon Black Dispersion in Polyolefin Geosynthetics
  - 4. ASTM D5191 - Standard Test for Thickness Vapor Pressure of Petroleum Products

5. ASTM D1505 - Standard Test for Density
6. ASTM D792 - Standard Test for Density
7. ASTM D6693 - Standard Test for Tensile Properties
8. ASTM D1004 - Standard Test for Tear Resistance
9. ASTM D4873 – Standard Guide for Identification, Storage and Handling of Geosynthetics
10. ASTM D746 - Standard Test for Brittleness Temperature
11. ASTM D1204 - Standard Test for Dimensional Stability
12. ASTM D1693 - Standard Test for Environmental Stress Crack
13. ASTM D4833 - Standard Test for Puncture Resistance
14. ASTM D4437 - Standard Test for Integrity of Field Seams
15. ASTM D6497 - Standard guide for Mechanical Attachment of Geomembrane to Penetrations or Structures

C. Pennsylvania Department of Transportation Officials (PennDOT)

1. PennDOT Publication 408 – Highway Construction Specification

D. City of Philadelphia Quality Control Standards

1. QC 14 – City of Philadelphia Standard for Testing Geosynthetics (under development).

1.04 SUBMITTALS

- A. Submit complete shop drawings and product information for all items to be furnished under this Section upon receipt of notice to proceed and prior to construction.
- B. Submit a mill certificate from the manufacturer certifying that the supplied material meets the chemical, physical and manufacturing requirements specified herein.

1.05 MEASUREMENT AND PAYMENT

- A. Payment for all geosynthetics work as described in the Drawings or specified herein shall be included in the prices bid for associated work. No additional payment will be made for maintenance or repair to the protective materials employed.
- B. Geomembranes, as shown on drawings, will be paid for at the prices bid for associated work.
  1. The price bid shall include installation of any geotextile to be placed between subgrade and liner per plans.
  2. Geomembrane liners will be bid by completed liner area, not including overlap for welds or at corners. The circular area of pipe penetrations does not have to be subtracted when determining liner area.
- C. Installation of watertight boot seals at geomembrane pipe penetrations will be paid for at the price bid for associated work.

1.06 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary trades and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

1. The geomembrane shall be installed by crews experienced in the installation of HDPE/LLDPE sheet of the type and thickness specified. The installation supervisor shall have supervised in the field or installed at least five hundred thousand (500,000) square feet of the geomembrane material being installed. All seamers shall have at least five hundred thousand (500,000) square feet of HDPE/LLDPE geomembrane seaming experience.
- B. Codes and Standards: Perform work in compliance with applicable requirements of governing authorities having jurisdiction.
- C. General material manufacturing procedures shall be performed in accordance with the manufacturer's internal quality control guidelines.
- D. The Quality of the provided and placed material shall at a minimum comply with the following:
  1. PennDOT Publication 408 – Highway Construction Specification
- E. A competent laboratory shall be maintained by the manufacturer of the geosynthetics at the point of manufacture to ensure quality control in accordance with ASTM testing procedures. The laboratory shall maintain records of its quality control results and shall provide, upon request, a manufacturer's certificate that includes the following.
  1. Name of manufacturer
  2. Chemical composition
  3. Product description
  4. Statement of compliance to specification and verification test results
  5. Signature of legally authorized official attesting to the information required

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. Geotextiles - All storage and handling of the geotextiles shall conform to ASTM D4873, "Standard Guide for Identification, Storage and Handling of Geosynthetics".
  1. During all periods of shipment and storage, the geotextile shall be protected from moisture, direct sunlight, ultraviolet rays, temperatures greater than one hundred and forty (140) degrees F, mud, dirt, dust, and debris.
  2. The geotextile shall be covered in an opaque and waterproof protective wrapping, prior to leaving the manufacturing facility. Each roll of geotextile in the shipment shall be labeled with the manufacturer's name, geotextile style and type, lot and roll numbers, and roll dimensions.
  3. The geotextile shall be handled carefully both during shipment, initial unloading and handling in the work area. The Contractor shall provide sufficient manpower and equipment to ensure appropriate handling of the geotextile. If the geotextile is damaged during unloading, storage or onsite transportation, PWD shall determine the extent of the damage and the damaged material shall be rejected.
  4. The geotextile shall be stored onsite at a location selected to minimize handling.
- B. Geomembranes - All storage and handling of the geomembranes shall conform to ASTM D4873, "Standard Guide for Identification, Storage and Handling of Geotextiles". During transportation, the geomembrane shall be covered. The delivered rolls of finished material shall be marked to state the following minimum information:

1. Name of manufacturer
  2. Product type
  3. Product thickness
  4. Manufacturing batch code
  5. Date of manufacture
  6. Physical dimensions (length and width)
- C. The geomembrane rolls shall be stored onsite at a location that shall be selected to minimize onsite handling. The Contractor shall confirm that the material is stored in a secure area with provisions for protection from traffic, vandals, and adverse weather to avoid damage. Geomembrane rolls shall not be stacked in a manner that could cause damage to underlying rolls. The stacking of geomembrane shall not be higher than two rolls.
- D. The material shall be inspected to confirm that it is not damaged, including but not limited to:
1. Punctures from handling, nails, splinters or other deleterious material
  2. Tears from operation of equipment or inadequate packaging
  3. Exposure to temperature extremes resulting in unusable material
  4. Blocking resulting from the bounding together of adjacent membrane layers to excessive heat and pressure
  5. Crumpling or tearing from inadequate packaging support
- E. At the site, the geomembrane rolls shall be unloaded and placed on a smooth surface free of rocks, mud, debris, or any other protrusions that may damage the material. Materials shall not be stored directly on the ground. The Contractor shall provide adequate equipment and personnel at the time of each delivery to ensure that the geomembrane is not damaged. Personnel shall handle the geomembrane with care. Any extrudate delivered at the site prior to the installer's mobilization shall be kept covered and dry.

## 1.08 DEFINITIONS

- A. MARV – Minimum Average Roll Value (MARV) is a manufacturing quality control tool used by all manufacturers to establish published values such that the user/purchaser will have a 97.7% confidence that the property in question will meet published values. MARV is calculated as the typical value minus two standard deviations.

## 1.09 INSPECTION AND MATERIALS

- A. All materials shall be inspected upon arrival at the site to ensure they meet specified requirements and are free of any damage.
- B. When damage to the surface of a roll has occurred, examination of the underlying material shall be conducted. If damage is found, PWD shall examine the entire roll for damage. Geomembrane materials showing damage shall be isolated, clearly labeled as damaged, and removed from site, by the Contractor. The Contractor will be held responsible for geosynthetics damaged during the construction process and will be required to replace them.

## PART 2 PRODUCTS

### 2.01 GEOTEXTILES

- A. Non-woven geotextile (drainage filter fabric) shall have the following properties at a minimum. Non-woven Geotextile shall be Mirafi 180N, US Fabrics US205NW, Propex Geotex 801, Thrace-LINQ 180EX, or approved equal.
  1. Minimum flow rate 90 gal/min/ft<sup>2</sup> (ASTM D4491)
  2. Minimum grab tensile strength 200 lbs (ASTM D4632)
  3. Minimum CBR puncture strength 300 psi (ASTM D6241)
  4. Minimum tear resistance 80 lbs (ASTM D4533)
  5. Minimum UV resistance 70% retained strength (ASTM D4355)
- B. Geotextiles associated with modular stormwater systems shall be as specified by the manufacturer. All geotextiles and geogrids to be employed are subject to approval by PWD, and products approved in conjunction with modular stormwater systems (or other proprietary requirements) shall not be considered approved for any other use unless specifically noted.

## 2.02 GEOMEMBRANES

- A. The geomembrane employed shall be a synthetic material that meets the physical, mechanical and chemical properties as set forth herein and as confirmed by the manufacturer. Material shall be resistant to mildew and rot, ultraviolet radiation, insects, and rodents.
- B. Geomembrane material shall be smooth High Density Polyethylene (HDPE) or Linear Low Density Polyethylene (LLDPE) with a minimum thickness of 30 mil.
- C. Smooth HDPE geomembrane shall conform to the physical requirements stipulated in the Geosynthetic Research Institute (GRI) – GM13 Standard Specification for HDPE geomembranes: <https://geosynthetic-institute.org/grispecs/gm13.pdf>.
- D. Smooth LLDPE geomembrane shall conform to the physical requirements stipulated in the Geosynthetic Research Institute (GRI) – GM17 Standard Specification for LLDPE geomembranes: <https://geosynthetic-institute.org/grispecs/gm17.pdf>.
- E. Project specific geomembranes shall be as dictated on the Contract Drawings or equivalent product as approved by PWD.
- F. Boot seals at pipe penetrations through geomembrane shall be secured to pipe with half-inch-wide stainless steel pipe clamps with neoprene rubber cushion. Double-sided butyl tape sealant and polyurethane, non-silicone caulk such as Sikaflex shall be used. For boot on corrugated pipe, a corrugated pipe adapter (Trelleborg CGA or approved equal) shall be used to provide a smooth outer pipe surface for clamps.

## PART 3 EXECUTION

### 3.01 GENERAL REQUIREMENTS

- A. All geosynthetic materials shall be placed at the lines and grades as shown on the Contract Drawings and as specified herein.

### 3.02 GEOTEXTILE INSTALLATION

- A. During placement of the geotextile and overlying materials, no construction equipment of any kind should operate or be operated directly on the geotextiles.
- B. The surface to receive fabric shall be prepared to a relatively smooth condition free of obstructions, depressions, sudden grade changes, debris, and soft or low density pockets of

material. Fabric shall be laid smooth and reasonably free of tension, stress, folds, wrinkles, or creases. Geotextiles shall be cut using a manufacturer-approved geotextile cutter only.

- C. The fabric shall extend a minimum of one (1) foot beyond the edge of the excavation if possible. At the time of installation, fabric shall be rejected if it has defects, rips, tears, holes, flaws, deterioration, or damage incurred during manufacture, transportation, or storage.
- D. The Contractor shall provide temporary wind anchorage during geotextile installation by means of tires, sandbags or other means submitted to PWD for approval. These temporary anchors shall be removed prior to fill placement. The geotextile rolls shall be shingled and the direction of fill placement over them shall be in the direction of this shingling so that the fill placement does not disturb the overlaps. The geotextile shall be placed in such a manner that placement of the overlying materials shall not excessively stretch or tear the geotextile. At the discretion of PWD, securing pins shall be used to hold the fabric firmly in place prior to placing aggregate, fill, or backfill.
- E. The geotextile strips shall be placed to provide a minimum width of two (2) feet of overlap for each joint. In excavations that do not allow careful positioning and securing with a suitable overlap of at least two (2) feet, sections shall be joined by field sewing. The thread shall be capable of supplying seam strength of 80 percent of the required tensile strength utilizing a Type 401 two-thread chain stitch with a “J” seam. The stitches shall be a minimum of two (2) inches from the fabric edge.
- F. The work shall be scheduled so that 14 calendar days do not expire between the placement of the geotextile and the covering of the geotextile with a layer of required material. If the 14-day maximum exposure period is exceeded, the geotextile shall be removed and replaced.
- G. Any damage to the geotextile during installation or placement of cover material shall be immediately repaired. A geotextile patch shall be placed over the damaged area and extend three (3) feet beyond the perimeter of the tear, hole, or damage.

### 3.03 GEOMEMBRANE INSTALLATION

- A. The geomembrane shall be installed in accordance with these Specifications and the manufacturer's recommendations, to the limits indicated on the Drawings. Installation work shall not begin until all required drawings and quality control data have been submitted to PWD, and the installer has certified the acceptability of the receiving subgrade surface in writing.
- B. Geomembrane liner materials shall be not placed until the receiving surface has been inspected by the installer and the installer certifies in writing that the surface on which the geomembrane shall be installed is acceptable. A walk-through inspection shall be performed by PWD and the installation contractor prior to placing any geomembrane. It shall be the responsibility of the Contractor to keep the receiving surface in the accepted condition until the geomembrane installation is complete.
- C. The geomembrane surface shall be inspected as it is unrolled. If damage or faults not previously observed are discovered, they shall be clearly marked and the respective sheet roll shall be set aside. Damaged areas shall be repaired, or the entire roll shall be removed from the site.
- D. Extreme care shall be taken during installation of the geomembrane so that no damage is done to any part of the material. Smoking and use of glass containers by installation personnel shall be prohibited. All handling and installation procedures used by the Contractor shall not damage the liner. If damage occurs, changes in equipment and procedures may be required.

- E. No construction equipment shall be allowed on the geomembrane. No gasoline driven generators or cans of gas or solvent shall be placed directly on the geomembrane material. Under no circumstances shall the geomembrane material be used as a work area to prepare patches or to store tools and supplies.
- F. All rips, tears, punctures, or other injuries to the geomembrane shall be repaired the same day they occur in accordance with procedures as specified herein. Excessive patching, as determined by PWD, shall result in removal and replacement of the affected geomembrane sheet, at no expense to PWD.
- G. Cleanup within the geomembrane area shall be an ongoing responsibility of the Contractor. Particular care shall be taken to ensure that no trash, tools, and other unwanted materials are dragged across or trapped beneath the geomembrane. Care shall be taken to ensure that all scraps of geomembrane material, extrudate, and other installation related debris are removed from the work area. The geomembrane shall be swept to remove debris and windblown soils.
- H. Only geomembrane panels scheduled for each day's field seaming shall be spread each day. Panels shall be held in position by sandbags until field seaming is complete. Sandbags shall be close knit to prevent fine material from exiting the bag. Metal or wire ties shall not be used.
- I. The geomembrane shall be placed in a manner to minimize the number and length of field seaming. All geomembrane panels over twenty-five (25) square feet in area shall be designated with a panel number. The Contractor shall be responsible for assigning the number, and shall locate the panel and roll numbers near the middle of panels less than fifty (50) feet in length, and at both ends of panels over fifty (50) feet in length. These numbers shall be noted on daily progress reports, and shall correspond to the drawings initially submitted by the Contractor. Panels under twenty-five (25) feet square shall be considered a patch and shall not require a panel number.
- J. The installation shall allow for thermal expansion and contraction of the geomembrane. Adequate compensation for liner thermal affects and sheet stability shall be allowed for by the installer. Compensation strips shall be installed as required and shall be clearly noted on the progress reports. The Contractor shall install at each penetration or appurtenance sufficient compensation to eliminate stress at the liner anchorages due to temperature and sheet stability contraction.
- K. The Contractor shall provide temporary wind anchorage during geomembrane installation. Placement of overlying material shall be performed in a manner that shall not damage the geomembrane. Excessive wrinkling of the geomembrane shall not be permitted prior to or while covering the geomembrane. Permanent folds or wrinkles in the geomembrane shall not be permitted. Folds or wrinkles that occur shall be uncovered and inspected. Damage to the geosynthetic materials shall be repaired immediately.

#### 3.04 GEOMEMBRANE SEAMING

- A. Field seams shall be made by extrusion or fusion welding methods. Extrusion welding shall only be used in areas where fusion welding equipment cannot operate.
- B. The installer shall use only welding apparatus that allow proper control of extrudate or wedge temperature, apparatus pressure, welding speed, width of weld, and sheet preheating temperature. Certification that the welding apparatus meets these requirements shall be submitted to PWD before any field seams are made. Welding apparatus or employees shall not damage the geomembrane.



- C. A seam numbering system compatible with a panel numbering system shall be established and submitted to PWD prior to geomembrane installation. This information shall be included on the daily progress reports.
1. Test Welds - A test weld, approximately ten feet in length, a determination of sheet surface temperature, and visual inspection of the seam surface and cross-section shall be performed satisfactorily before any additional seam welding is begun each day. These requirements shall be the responsibility of the installer. Test welds shall be made under the same conditions as actual welded seams. PWD may require a test weld be made at any time during seaming production to verify equipment, operator performance, and seam integrity.
  2. Four one inch wide specimens shall be cut from the test weld, each having the seam centrally located. Using a field tensiometer, two specimens shall be tested in peel and two in shear. If any sample fails in the seam, the operation shall be repeated, until the deficiencies are corrected and two consecutive successful test welds are achieved. After positive evaluation of the test weld, the production seaming shall begin.
  3. Production Seaming - Before production seaming, the seam areas shall be cleaned of all dust, dirt, and other foreign material. A visual inspection of the seaming surface and cross-section shall be performed before any seam welding or equipment startup has begun. Welding shall not be performed unless the sheet is dry and the sheet temperature has been determined to be above thirty-two (32) degrees F and below one hundred and twenty-two (122) degrees F. The installer may propose seaming procedures for adverse weather conditions. Such procedures shall be submitted to PWD for review and approval prior to use.
  4. Extrusion seams shall be made by overlapping adjacent sheets a minimum of three inches (3") and extruding a ribbon of hot fusion-joining resin no less than three-quarter inch in width between the overlapped sheets or over the seams between the overlapped sheets. Extrusion field seams shall be made only in areas where fusion seaming is not practical. The sheet surface for extrusion welding shall be roughened by an acceptable means before extrudate is placed. Excessive grinding resulting in grooving of the liner or reducing liner thickness greater than ten (10) percent shall not be permitted. Grinding shall not be performed parallel to the seam.
  5. Fusion field seams shall be made by overlapping adjacent sheets a minimum of three inches (3") and forming a double welded seam separated by an air space approximately 0.375 inch in width. Fusion welded seams shall be produced by a double hot shoe welder capable of maintaining a recordable temperature determined by onsite conditions and shall not vary more than ten (10) degrees C from the target temperature.
  6. All attachments of geomembrane to penetrations or structures must be watertight and installed in accordance with ASTM D6497.
  7. A boot seal must be used for all pipe penetrations through the geomembrane. Boot seal must be installed on the inside (stormwater storage side) of geomembrane liner. Pipe boot skirt shall be field welded to geomembrane liner using an extrusion weld joint gun. The seaming procedure shall consist of cleaning and roughening the surface, and softening the geomembrane material by application of heated air. Directly following the application of heat, a hot strip of geomembrane resin shall be extruded over the seam to produce the welded seam. Boot shall be secured to pipe with two (2) half-inch-wide stainless steel pipe clamps with a continuous strip of neoprene rubber as a cushion between clamps and boot. For boot on corrugated pipe, a corrugated pipe adapter shall be used to provide a smooth outer pipe

surface for clamps. Double-sided butyl tape sealant shall be applied continuously between outer pipe surface and boot. End of boot shall be sealed with a continuous outer bead of caulk.

8. Repairs - Repairs of small holes (up to 1/2 inch diameter) in the geomembrane surface shall be made with an extrusion joint gun. Geomembrane materials shall be cleaned of all dirt, dust, and other foreign material, all HDPE surfaces roughened, heated to the prescribed temperature, and a hot strip of geomembrane resin extruded over the hole to produce a fusion-welded repair.
9. Larger holes shall be repaired with a patch and extrusion joint gun. A patch, meeting the requirements of the HDPE/LLDPE membrane, shall be placed over the hole. The patch shall completely cover the hole, with a minimum clearance between the hole and edge of patch of three inches (3"). Membrane and patch material shall be cleaned of all dirt, dust, and other foreign material. All geomembrane surfaces shall be roughened, heated to the prescribed temperature, and the patch extrusion welded to the membrane to complete the repair. All patches shall have rounded corners.

### 3.05 GEOMEMBRANE SEAM TESTING

- A. A program of both non-destructive and destructive testing shall be performed by the Contractor to confirm geomembrane seam quality at the discretion of PWD.
  1. Non-destructive Vacuum Testing - Continuous vacuum box testing shall be performed on all extrusion welded seams and repairs. The vacuum box assembly shall consist of a rigid housing, a transparent viewing window, a soft neoprene gasket, a port hole or valve assembly, and a gauge to indicate chamber pressure. The vacuum box shall be in like new condition with an undamaged gasket and a clear and unobstructed viewing window. A soapy solution shall be applied to the geomembrane seam over an area of approximately twelve inches (12") by forty-eight inches (48"). The vacuum pump shall be energized to reduce the tank pressure to approximately five (5) psi. Sufficient pressure shall be applied to the box to provide a leak tight seal. For a period of not less than thirty (30) seconds, the seam shall be examined by viewing through the transparent window. The box shall be moved over to the next adjoining area, with no less than three inches (3") of overlap, and the process shall be repeated. If no bubbles appear, the seam shall be considered to pass this non-destructive test. If bubbles do appear, the area shall fail the test, be marked, repaired and retested. Extrusion weld seams that do not permit vacuum box testing (on short slopes, corners, or details) shall undergo ultrasonic testing similar to the Ultrasonic Shadow Method. The Contractor shall be responsible for submitting the testing method to be used in these instances to PWD.
  2. Non-destructive Air Pressure Testing - Air pressure testing shall be performed on all double fusion welded seams. Prior to testing, both ends of the seam shall be sealed without cutting or damaging the parent material. A needle, or other approved pressure feed device, shall be inserted into the channel created by the double track fusion seam process. A protective cushion shall be placed between the air pump and the geomembrane. All forty (40) mil double fusion seams shall be tested at thirty (30) psi over the maximum uninterrupted panel seam length for five (5) minutes. If the pressure drop in the seam exceeds three (3) psi., or if the pressure fails to stabilize, the leak shall be located, repaired and retested. The installer, in the presence of PWD, shall verify that the air flows through the entire channel by removing the seal at the end of the channel away from the air source and observe the loss of pressure on the gauge. If it is determined that there is a blockage along the channel, the seam shall be

repaired. Upon completion of this testing, the needles shall be removed from the seams, and the holes and any damage to the geomembrane be repaired.

3. Destructive Testing – Destructive testing shall be performed on samples of production seams to confirm seam quality. The location of the seam samples shall be selected by PWD. A sample coupon of production seams approximately thirty-six inches (36”) long by twelve inches (12”) wide, shall be taken every four hundred feet (400’) of seam. When the ambient temperature six inches (6”) above the liner reaches one hundred (100) degrees F, shear and peel destructive tests shall be run at a frequency of every one hundred to two hundred (100-200) feet of seam, or as directed by PWD. The sample coupon shall allow for a total of ten (10) one inch (1”) wide production field seams to be tested. Five samples shall be tested for bonded shear strength and five samples shall be tested for seam peel adhesion in accordance with ASTM D4437, latest revision. All testing shall be performed at the installer’s quality control laboratory.
4. A portion of each sample coupon twelve inches (12”) x twelve inches (12”) shall be labeled and supplied to PWD for archiving purposes.
5. The minimum seam strength values required for all samples obtained from fusion and extrusion welded seams shall be sixty pounds (60 lbs.) per inch for seams tested in peel, and sixty-six pounds (66 lbs.) per inch for seams tested in shear. All five (5) of the specimens tested in shear and four (4) out of five (5) of the specimens tested in peel shall fail in Film Tear Bond (FTB), that is, the break should occur in the parent geomembrane. The failure mechanism of the seam shall be ductile in nature, with no indication of crystallization.
6. If the sample proves defective additional testing shall be performed to determine the extent of the defect. A test section a minimum of ten feet (10’) on both sides of the failed seam location shall be retested. If these tests pass, the weld between these areas shall be cap stripped. If failure occurs, the testing shall be continued until the extent of the defect is established. All defects shall be repaired. Cap strip repairs shall be performed and tested according to the methods described above.
7. The geomembrane shall not be covered until acceptable destructive and non-destructive testing has been completed.
8. Destructive seam sample reports shall be delivered to PWD within 48 hours of obtaining the sample from the production seam. Test results shall be signed by the installer's laboratory Quality Control Manager. It is the installer's obligation to forward to PWD all seam reports, labeled with the weld seam number as per the installation drawings.
9. Contractor is to repair all geomembrane where samples were taken.

### 3.06 PLACEMENT OF OVERLYING MATERIAL

- A. The placement of the overlying granular material shall be coordinated so that no more than 14 calendar days elapse following geotextile or geomembrane placement.

### 3.07 DOCUMENTATION

- A. The Contractor shall perform a visual inspection on each sheet for puncture, tears, rips, or other injuries.
- A. Contractor shall maintain daily installation progress reports and shall make them available to PWD upon request. Installation reports shall include the following:

1. Names and job description of personnel
  2. Date
  3. Weather conditions
  4. Project location
  5. Panels installed
  6. Panels seamed, including panel and seam number
  7. Repair (puncture, tears, rips, or other injuries, method of repair)
  8. Field observations
  9. Roll number of each panel
- B. Submit as-built survey in compliance with Section 01101.

END OF SECTION

## SECTION 02500

### PAVING AND SURFACING WITHIN PUBLIC RIGHT-OF-WAY

#### PART 1 GENERAL

##### 1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidental work required to replace all pavement, surfacing, and traffic signs removed or otherwise disturbed by the Contractor's operations.
- B. Furnish all labor, materials, equipment and incidental work to replace curbs, including breakaway traffic delineators, as indicated in the Drawings.

##### 1.02 TEMPORARY PAVING FOR CITY STREETS

- A. Temporary asphalt paving shall be placed immediately (within the same day) after backfill of pipe trenches as shown in Temporary Paving Detail in Appendix I.

##### 1.03 TEMPORARY PAVING FOR STATE ROUTES

- A. Temporary asphalt paving shall be placed immediately (within the same day) after backfill of pipe trenches. Paving shall comply with the latest PennDOT regulations.

##### 1.04 RELATED SECTIONS

- A. Section 01570 Traffic Regulation
- B. Section 02510 Concrete Curb Ramp
- C. Section 02700 Sewerage and Drainage

##### 1.05 REFERENCE STANDARDS

- A. It is the Contractor's responsibility to be thoroughly familiar with the most recent revision or amendment to the Philadelphia Streets Department and Pennsylvania Department of Transportation (PennDOT) standard specifications for paving work, including the following:
  - 1. Philadelphia Streets Department, Standard Specifications for Paving and Repaving.
  - 2. Philadelphia Streets Department, Standard Construction Items.
  - 3. PennDOT, Publication 408 Specifications.
  - 4. Standard Specifications of track owner for paving restoration in track areas, where applicable.
- B. Conform fully to above standard specifications. Meet all requirements for submittals; delivery, storage and handling; acceptable manufacturers; materials; equipment; mixes; preparation; placing; protection of completed work; and all appurtenant requirements.
- C. In accordance with the Americans With Disabilities Act, newly constructed or altered street level pedestrian walkways shall contain curb ramps or other sloped areas at intersections to streets, roads, or highways. To comply with the Act, the Philadelphia Water Department will construct depressed curb handicapped-access ramps at street intersections where the footway is to be replaced as a result of sewer or water main or green stormwater infrastructure work. It will be the Contractor's responsibility to construct these ramps in accordance with current PennDOT Specifications. Refer to Section 02510 Concrete Curb Ramp for additional details.

##### 1.06 SUBMITTALS

- A. PWD shall be notified at least 48 hours prior to the start of any restoration work done under this Contract in order to set up a repaving meeting with the Highway District Engineer.
  - 1. 1st Highway District, 48th & Parkside.....(215) 685-0168
  - 2. 2nd Highway District, 11th & Wharton..... (215) 685-1858
  - 3. 3rd Highway District, 9th & Spring Garden .....(215) 685-3922
  - 4. 4th Highway District, 6249 Wissahickon.....(215) 685-2191
  - 5. 5th Highway District, Whitaker & Luzerne.....(215) 685-9843
  - 6. 6th Highway District, Bustleton & Bowler.....(215) 685-0352
- B. All materials used in the prosecution of Work under this Section are subject to review and approval by the appropriate Owner (Philadelphia Streets Department and/or PennDOT). PWD does not approve these materials; the Contractor shall conform to the standards and testing regimens as noted above. PWD reserves the right to refuse substandard Work under any relevant standard specification as necessary.

1.07 MEASUREMENT AND PAYMENT

- A. Paving work will be paid for at the lump sum prices bid for associated work, which will include full payment for all paving work not incidental to other items of work, as described with the City of Philadelphia Department of Streets Standard Construction Items.
- B. Curb, Footway and Driveway Repaving:
  - 1. Where curb, footway and driveway restoration is incidental to any item of work listed in the Proposal, such restoration will not be measured for separate or additional payment; neither will such restoration be measured for deduction from other items of work.
- C. The following are incidental to paving items, and no separate or additional payment will be made for this work:
  - 1. Removal of existing paving outside payment limits defined for Excavation (e.g., cutbacks).
  - 2. Adjustment of manhole frames and covers.
  - 3. Restoration of the original pavement markings and traffic signage, including stop sign pole in stormwater trench as shown on plans (if any).
  - 4. Restoration of paving over existing manholes where frames and covers are removed outside the payments limits defined for Excavation.
  - 5. Adjustment to preconstruction elevations at property line or any existing surfaces to remain.
  - 6. Removal of temporary paving and excess backfill material before paving.
  - 7. Subgrading and furnishing and install of stone subbase required below paving..
- D. Paving done beyond limits specified or shown on Drawings will not be measured for payment unless ordered in writing by PWD. All right-of-way paving within the limits of construction disturbance shall be replaced as herein specified unless otherwise specified or directed by PWD. Footway and curb shall be restored to the nearest joint beyond the extents defined by the disturbance or as directed by PWD.
- E. Obtain from PennDOT District Highway Engineer additional requirements for excavating, backfilling, compacting, and restoring paving in any State Highways affected by this project.

Meet all such additional requirements. Include all costs of such additional requirements in prices bid for repaving items. There will be no separate or additional payment for meeting such requirements.

- F. Temporary paving shall be paid for lump sum prices bid for associated . No additional payment shall be made for repairs to temporary paving.

#### 1.08 PHILADELPHIA STREETS DEPARTMENT REQUIREMENTS

- A. The Contractor is required to obtain a highway opening permit for work associated with the installation of green stormwater infrastructure in the right-of-way. Coordinate this activity with Michelle Brisbon of the City Highways Division – Right-of-Way Unit at 215-686-5621 or via email at michelle.brisbon@phila.gov.
- B. The Contractor may contact the Streets Department to obtain all necessary permits and to arrange for Engineering Services. The contacts for these services are listed below:
  - 1. Streets Department Permits Unit: Shaun McKeown (215) 686-5524
  - 2. Engineering Services
    - a. 2nd Survey District: Michael Labrum (215) 685-1865
    - b. 4<sup>th</sup> Survey District: Charles Fuller (215) 685-0351
    - c. 5th Survey District: Herman Ledger (215) 685-0585
    - d. 7th Survey District: Karl Kriegh (215) 685-2669
    - e. 9th Survey District: John Parkinson (215) 685-3053

### PART 2 PRODUCTS

#### 2.01 SUPERPAVE BINDER COURSE

- A. Furnish Superpave Bituminous Binder Course in accordance with Section 409 of PennDOT 408 / 2007 Specification with the following additions:

Binder Course Mixture: 19 mm Mix

ESAL range:

Type A: < 0.3 million

Type B: 0.3 to < 3 million

Type C: 3 to <10 million

#### 2.02 SUPERPAVE WEARING COURSE

- A. Furnish Superpave Bituminous Wearing Course in accordance with Section 409 of PennDOT 408 Specification with the following additions:

Wearing Course Mixture: 9.5 mm Mix

ESAL range:

Type A: < 0.3 million

Type B: 0.3 to < 3 million

Type C: 3 to <10 million

## 2.03 CONCRETE BASE, STONE SUBBASE, CURBING AND OTHER MATERIALS

- A. All additional paving materials required to restore the street, curbs, and sidewalks to the extents defined herein and on the Drawings, shall be as specified in the Philadelphia Streets Department Standard Specifications for Paving and Repaving, the Philadelphia Streets Department Standard Construction Items, PennDOT Publication 408, or other relevant document. All questions regarding materials and construction shall be referred to the Philadelphia Streets Department, and in the event of conflicting standards the more stringent shall be considered applicable.

## 2.04 BREAKAWAY TRAFFIC DELINEATORS

- A. Traffic delineator posts shall be installed as indicated on the Drawings.
- B. Where the product is not specified on the Drawings, posts shall be the PexCo-Davidson City Post 200DP-EFX, Street Smart Solutions 3S-5200 BounceBack, US Barricade Model 300, or approved equal. Posts shall be constructed of round thermoplastic polyurethane, MUTCD and NCHRP350 compliant, ultraviolet-resistant black with silver reflective banding.

## 2.05 BREAKAWAY TRAFFIC SIGNAGE POSTS

- A. New breakaway post shall be two-inch (2") square, fourteen gauge (14 AWG) hot-dipped galvanized steel with a two-and-a-quarter inch (2¼ ") square pole base, per Streets Department Standard Detail Drawing #M0086 (Traffic Sign, Post-Mounted).
- B. Surface mount base, for signage other than stop signs located above the footprint of a stormwater trench, shall be a six-inch (6") long two-and-a-quarter-inch (2 ¼") twelve gauge square perforated base tube mounted on a ten-inch square (10"x10") quarter-inch (1/4") thick steel plate with steel gussets for mounting reinforcement. Plate must be bolted to concrete at four corners. Ultimate Highway Solutions 2" Square Post Surface Mount Base or approved equal.

## PART 3 EXECUTION

### 3.01 CITY STREET CUTBACKS

- A. Cutbacks for City Streets include a base sawcut and a surface sawcut. The surface sawcut is a sawcut through the surface course. The base sawcut is a sawcut through both the surface course and the base course. The base sawcut shall be made prior the surface sawcut. All detached material after a sawcut shall be removed without damage to the adjacent pavement.
- B. If the trench is less than three (3) feet in width, the base sawcut shall be made on each side of the trench, through both the surface course and base course, nine (9) inches as measured from the edge of the trench and in the direction away from the trench.
- C. If the trench is greater than or equal to three (3) feet in width, the base sawcut shall be made on each side of the trench, through both the surface course and base course, twelve (12) inches as measured from the edge of the trench and in the direction away from the trench.
- D. The base sawcut shall be made prior to replacement of the base course.
- E. The surface sawcut shall be made on each side of the trench, through the surface course, six (6) inches as measured from the edge of the base sawcut and in the direction away from the trench.
- F. The surface sawcut shall be made a maximum of one (1) week prior to final pavement. The sawcut shall not be made prior to temporary paving.
- G. If the edge of a trench is within three (3) feet of a curb, the surface course, base course, curb, and the abutting footway pad to the curb shall all be included in the cutback.



- H. Cutbacks in the footway shall be to the nearest joint line from the edge of the trench unless otherwise specified by the Project Engineer.
- I. If the trench is in the footway and the curb abutting footway pad is removed, the base sawcut shall be measured eighteen (18) inches from the curb in the direction of the cartway. The surface sawcut shall be made six (6) inches from the base sawcut in the direction of the away from the curb.
- J. Cutback payments for the curb and street restoration will be measured and paid for in their respective payment items.
- K. See Appendix J for Trench Restoration Detail City Street.

### 3.02 STATE ROUTE CUTBACKS

- A. Cutbacks for State Routes include a single sawcut on each side of the trench. The sawcut is through both the surface course and base course, measured twelve (12) inches from the edge of the trench.
- B. The cutback shall be made prior to the replacement of the base course. All detached material shall be removed without damage to the adjacent pavement.
- C. If the edge of a trench is within three (3) feet of a curb, the surface course, base course, curb, and the abutting footway pad to the curb shall all be included in the cutback.
- D. If the trench is in the footway and the curb abutting footway pad is removed, the cartway cutback shall be measured twenty-four (24) inches from the curb in the direction of the cartway, and be made full depth through both paving course and base course.
- E. Cutbacks shall not extend beyond a transverse or longitudinal joints or curbs unless otherwise specified by the Project Engineer.
- F. Cutbacks in the footway shall be to the nearest joint line from the edge of the trench unless otherwise specified by the Project Engineer.
- G. Cutback payments for the curb and street restoration will be measured and paid for in their respective payment items.
- H. Refer to PA Code Chapter 459 Occupancy of Highways by Utilities for paving requirements on State Routes.
- I. See Appendix K for Trench Restoration Detail State Route.

### 3.03 TEMPORARY PAVING FOR PIPE TRENCHES IN CITY STREET

- A. Cartway and footway disturbed during construction for pipe trenches shall be given a layer of temporary paving resulting in a smooth traversable surface per the Temporary Paving Detail (Appendix I).
  - 1. 3" layer of Superpave binder course, Class PG 64-22, shall be applied in intersections, footways, and in cartways allowing thru traffic during construction.
  - 2. Some select backfill shall be removed during installation of the final permanent cartway and footway pavement. The costs for removal of the temporary paving shall be included in the respective prices bid for permanent pavement items.
  - 3. The Contractor shall maintain the temporary paving so that the surface remains smooth, traversable, and flush with surface until Permanent Paving is installed.

4. Care shall be taken to ensure that there is minimal settlement. Any settlement greater than 2” shall be repaired at the expense of the Contractor .
5. Paving shall be properly compacted using a roller.

### 3.04 TEMPORARY PAVING FOR STATE ROUTE PIPE TRENCHES

- A. Temporary paving shall be Superpave Bituminous Binder (PG 64-22 19mm mix), underlain by a minimum six inches (6”) of compacted subbase PennDOT 2A aggregate.

### 3.05 CARTWAY TRENCH RESTORATION PAVING RECONSTRUCTION IN CITY STREETS & STATE HIGHWAYS

#### A. CITY STREETS

##### ”B” STREET FROM CLARKSON AVENUE TO E OLNEY AVENUE.

1. Streets: Restore cartway paving disturbed as follows:

Prepare subgrade in accordance with Philadelphia Streets Department standards and restore with 8 inch concrete base flush with existing base, topped with a Superpave Binder Course, Class PG 64-22, variable depth, Type A and a Superpave Wearing Course, Class PG 64-22, 1-1/2” depth, Type A flush with existing surface or to lines and grades as directed by Streets.

- a. Intersections: Prepare subgrade in accordance with Philadelphia Streets Department standards and restore with 8 inch concrete base flush with existing base, topped with a Superpave Binder Course, Class PG 64-22, variable depth, Type A and a Superpave Wearing Course, Class PG 64-22, 1-1/2” depth, Type A flush with existing surface or to lines and grades as directed by Streets.

#### B. STATE HIGHWAYS

##### E OLNEY AVE FROM EDGE OF PROPERTY TO “B” STREET.

1. Streets: Restore cartway paving disturbed as follows:

- a. Prepare subgrade in accordance with PennDOT standards and restore with 10 inch thick, high early strength concrete base flush with existing base, topped with a Superpave Binder Course, variable depth, Class PG 64-22, Type A and a Superpave Wearing Course, Class PG 64-22, 1-1/2 inch depth, Type A, flush with existing surface or to lines and grades as directed by PennDOT or Streets.

- b. Restore at least 4 foot width of paving down to subgrade.

2. Intersections: Prepare subgrade in accordance with PennDOT standards and restore with 10 inch thick, high early strength concrete base flush with existing base, topped with a Superpave Binder Course, variable depth, Class PG 64-22, Type A and a Superpave Wearing Course, Class PG 64-22, 1-1/2 inch depth, Type A, flush with existing surface or to lines and grades as directed by PennDOT or Streets.

3. The Contractor may contact PennDOT directly with questions or concerns, and to arrange inspection services. Contact Anthony Antonelli (215-225-1415) for permits.

#### C. GENERAL REQUIREMENTS

1. Where concrete base restoration exceeds fifty percent (50%) of the street width, place 2A stone subbase, six-inch (6”) depth, prior to concrete base restoration.

2. Adjust manhole frames and covers where necessary.
3. Restore paving over existing manholes or valves where frames and covers are removed outside the payment limits defined for excavation. Match existing cartway structure to the satisfaction of PWD.
4. The Streets Department, Asphalt Division performs paving operations during the paving season which spans between March 15th and October 15th of each year, and/or as determined by the Chief Highway Engineer of the Streets Department. Asphalt restorations will not be performed after the end of the paving season or before the resumption of paving season.
5. During non-paving periods, the Contractor must maintain the work area in safe condition. All manhole, utility boxes, asphalt adjustments, driveway aprons, and curb ramps shall be adjusted accordingly and made safe until paving can be completed.
6. Prior to the start of construction, the Contractor shall contact Madeleine Antinucci at phone number 215-686-5505 to coordinate construction inspection for the proposed paving work as well as to schedule the Asphalt Division work for this project.

### 3.06 CURB, FOOTWAY AND DRIVEWAY PAVING

- A. Replace curbs to the dimensions, shape, and workmanship as the original curb, as shown on the Drawings (especially approved ADA-compliant ramp designs), or as otherwise directed by PWD. Construction methods shall be in accordance with PennDOT Pub. 408, Section 630. Paving limits shall be in accordance with Streets Department Detail SC0101, which dictates a minimum cartway and footway replacement width inherent to curb reconstruction.
- B. Installation of curbing and footway shall be performed in a manner that does not compromise the integrity of any stormwater system. In no instances will it be acceptable to stake, pierce, or otherwise damage an installed or existing system to facilitate curbing and footway construction. It is suggested that all curbing be formed using top-clamped forms or slip forming methods, and all surveying grades be marked with tautlines spanning the underlying systems.
- C. Where curb, footway or driveway paving are disturbed, outside of those areas shown on the drawings or otherwise specified, restore in kind, to extent determined by PWD, and to the satisfaction of the abutting property owners.
- D. Where not otherwise directed to replace the existing curbing and footway, or where not required to replace the existing curbing and footway due to construction activities, the Contractor shall maintain and support the existing curbing and footway as necessary during all construction activities.
- E. Within the limits of footway and/or driveway restoration, furnish and install L & I approved vent covers and water service boxes to replace non-conforming boxes. Existing boxes that meet code shall be reset. All work and materials shall be in accordance with the Philadelphia Streets Department, Standard Construction Items and the Philadelphia Plumbing Code.
- F. All footway surfaces shall be constructed in accordance with Streets Department Detail SC0101, such that no untreated height differential exists between the existing adjacent property and the new footway surfaces (particularly but not exclusively where footway restoration to the property line is required,). Treatments to remedy height differentials (when identified) may include, but are not limited to, cheek walls, foundation sealants, grass strips, non-compliant concrete paving, or other appropriate method as approved by PWD and Streets Department prior to installation.

- G. ADA-compliant ramps shall be installed as shown on the Drawings, or as directed by the Streets Department during the course of construction. See Section 02510 of these specifications for additional information.
- H. For any length of curbing more than twenty continuous linear feet, or area of footway/driveway paving more than fifteen linear feet in any direction or twenty-five contiguous square yards, to be restored, the Contractor shall be solely responsible for contacting the appropriate Streets Department Survey District a minimum of two (2) weeks prior to the start of work to request any necessary lines and grades to be set. No additional payment shall be made for coordination with Streets Survey or any delays to the Work resulting from said necessary coordination.
- I. Signage disturbed in the execution of construction activities under this Contract shall be reinstalled by the Contractor at no additional cost to the City.
  - 1. Signage shall be reinstalled according to the direction of PWD and the Standard Specifications of the Streets Department (Division 20-0700, 20-760, and 20-1707).
  - 2. All signage, except for street name signage, shall be reinstalled on posts with breakaway capability that conforms to PennDOT Pub. 408, Section 930. Existing breakaway posts may be reused if not damaged. The Contractor shall provide new breakaway posts to replace any non-conforming signage posts. Posts shall be installed per Streets Department Standard Detail Drawing #M0086 (Traffic Sign, Post-Mounted). Stop sign posts located above the footprint of a stormwater trench must be mounted as shown on plans. Breakaway posts for signage other than stop signs located above the footprint of a stormwater trench must use a surface mount base rather than the base post to avoid impacting the stormwater system.
  - 3. All existing signage shall be located from a fixed point, catalogued by description, and a photographic record created by the Contractor prior to removal. Any signage damaged in removal, storage, or reinstallation shall be replaced by the Contractor at no cost to the City. Any signage determined by Streets Department to be inadequate as existing upon removal shall be reinstalled as directed by Streets Department, with signs to be provided on-site by Streets Department and installation performed by the Contractor.
  - 4. The Contractor is responsible for proper installation of all existing and proposed signage. Signage not shown on the Drawings shall be reinstalled at no additional cost to the City; the Drawings are not guaranteed by the City to contain complete signage locations. The Contractor is encouraged to coordinate with Traffic Engineering Division of Streets Department to establish signage locations and reinstallation conventions prior to commencing work.
  - 5. All street name sign poles shall be as specified in Streets Department Standard Specification Division 20-760, and per Streets Department Standard Detail Drawing #TE0501.
- J. Breakaway traffic delineators shall be installed as per manufacturer's requirement.

### 3.07 JOINT SEALING

- A. All joints between new and existing bituminous wearing course shall be sealed with hot asphalt cement before surface has cooled.
  - 1. Apply seal evenly to the surface by squeegee immediately after final rolling. Seal with hot irons to completely fill surface voids and provide a watertight joint.
- B. After the bituminous wearing course is placed adjacent to manhole frames or inlet frames or City-owned structures, or other utility owned structures and before the surface has cooled, the

joint between the frame and wearing course shall be sealed with hot asphalt cement for a distance of six inches (6") from the edge of the frame.

1. The seal shall be evenly applied to the surface by squeegee immediately after final rolling to completely fill the surface voids and provide a watertight joint between the edge of the frame and the bituminous wearing course.
2. Precaution shall be taken so that no hot asphalt cement is poured between the frame and the cover or grate. The cover or grate must be easily removed and put back in its frame after the hot asphalt cement has cured

C. Before acceptance of the resurfacing work, all manhole frames and inlet frames shall be sealed properly as stated in the previous paragraph. The area at the edge between the manhole frame and manhole cover, the area at the edge between the inlet frames and inlet grates, all pickholes and lift holes and vent openings shall be free of asphalt cement.

### 3.08 CLEAN INLET BOX

A. Within the limit of full width street reconstruction and within the limit of full width street resurfacing, clean and remove debris from existing inlet laterals or as directed by PWD. The contractor shall remove and dispose of all debris from the inlet pipe to the storm water conduit or to the combined sewer. This work is incidental to paving items, and no separate or additional payment will be made for this work.

### 3.09 INLET MOUTH OPENING

A. Within the limit of full width street reconstruction and within the limit of full width street resurfacing the contractor shall be responsible for maintaining a minimum three inches (3") curb opening to all open mouth style inlets. The Contractor shall install concrete aprons at all curb-opening stormwater collection points (city inlets, lay-by inlets, trench drains, etc.) as shown on the Drawings, or the Contractor when necessary shall dish out the asphalt around the inlet opening, as shown on the attached sketch to accommodate for the minimum three inch (3") curb opening. This work is incidental to paving items, and no separate or additional payment will be made for this work.

B. Positive drainage shall be provided to any stormwater curb cut, trench drain opening, inlet opening, or other stormwater collection point. Any finished paving within the limits of the Contract that does not provide positive drainage to these or similar collection points shall be repaired to the satisfaction of PWD (up to and including full removal and replacement) by the Contractor at no additional expense to the City. This shall include any paving settlement within the first year after completion of the Work that creates an impediment to positive drainage.

### 3.10 PAVEMENT MARKINGS

A. Where existing pavement markings are disturbed, the Contractor shall restore them, in kind, and to the extent determined by PWD or as shown on the Drawings. There will be no separate or additional payment for this work, unless otherwise indicated on the Drawings and in these Specifications.

B. Where new pavement markings are proposed, the Contractor shall provide and install markings in accordance with the Streets Department Standard Specifications (or PennDOT Pub. 408, as appropriate), and at the direction of the Streets Department.

### 3.11 TOPSOIL AND SEEDING OR SODDING

- A. Where grass plot areas are disturbed or to be newly established, restoration shall be with topsoil and seeding or sodding as directed by PWD, and to the satisfaction of the abutting property owners. Restorative work will be paid for at the applicable Prices for Contingent Work, unless otherwise specified to be included in the prices bid. Newly seeded or sodded areas shall be established as depicted on the Drawings, and shall be paid under the price per square yard bid for seeding and sodding.

END OF SECTION

SECTION 02700  
SEWERAGE AND DRAINAGE

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This section includes all materials and appurtenant work necessary to furnish and install precast concrete inlet and manhole structures, junction boxes, control structures, and overflow structures, ductile iron pipe or HDPE/PP pipe connecting inlets or control structures to stormwater trenches, vitrified clay pipe connecting inlet structures to sewers, trench drains, curb cuts with and without wheel guard, and underdrain connections to structures from stormwater conduit piping as shown on the drawings. All orifice, underdrain, distribution, or other piping that connects to a structure shall have the connection constructed per these Specifications.

1.02 TEMPORARY PAVING

- A. During backfill of pipe trenches, the Contractor shall immediately apply select fill and temporary paving as detailed in Section 02500, Paving and Surfacing.

1.03 RELATED WORK

- A. Section 02135 Erosion and Sedimentation Control
- B. Section 02161 Sheeting and Shoring
- C. Section 02210 Earthwork
- D. Section 02500 Paving and Surfacing
- E. Section 02707 Thermoplastic Drainage Pipe and Fittings
- F. Section 02709 Subsurface Stormwater Storage
- G. Section 02720 Stormwater Surface Features

1.04 REFERENCE STANDARDS

- A. All sewer work under this contract shall be governed by, and done in accordance with the most recent revision or amendment to the Standard Specifications and Standard Details of the Philadelphia Water Department, including the following:
  - 1. Standard Details and Standard Specifications for Sewers.
  - 2. Standard Specifications for Excavation, Refilling, Grading, Landscaping and Repaving.
  - 3. Standard Specifications for Masonry: Concrete.
  - 4. Standard Specifications for Masonry: Stone and Brick.
  - 5. Standard Specifications for Gray and Ductile Iron
- B. The Standard Detail for Saddle Connection to RC Pipe Sewers is hereby modified so that the openings for the lateral connections shall be core drilled and rubber saddles shall be substituted in place of clay saddles. The 2000 psi concrete encasement around the saddle shall be extended to the cradle of sewer as shown in the Detail for Resilient Saddle Connection to RC Pipe Sewers affixed to the end of these specifications.

- C. The Standard Detail for cast in place and brick Wellholes is hereby modified so that a 5000 psi concrete base slab (12" thick) is cast separately from the brick or concrete walls. The base slab shall have the dimensions shown in the Standard Details.
- D. All materials and workmanship shall conform to the most recent revision or amendment to the following standards, except as modified by the Contract Documents:
  - 1. ASTM C94, Standard Specification for Ready-Mixed Concrete.
  - 2. ASTM C890, Standard Practice for Installation of Monolithic or Sectional Precast Concrete Water and Wastewater Structures.
- E. ASTM C109, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-inch or 50 mm Cube Specimens).
- F. ASTM D638, Test Method for Tensile Properties of Plastics.
- G. ASTM D695, Test Method for Compressive Properties of Rigid Plastics.
- H. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

#### 1.05 SUBMITTALS

- A. Submit a list of materials to be provided for work under this Section for any products not covered under PWD Quality Certification Standards. Include the name and address of the materials producer, the location from which the materials are to be obtained, part numbers, and shop drawings.
- B. Ready-Mixed Concrete: Before starting work, submit to Project Manager a copy of manufacturer's QCS-approved mix design for concrete to be delivered under this Contract. For each truckload of concrete delivered, submit a batch ticket in accordance with QC-3.
- C. Certificates of Compliance: Before installation of any Precast Concrete Products, Gray / Ductile Iron Casting, Ready-Mixed Concrete, Welded Steel Inlet Frame or Grates, Reinforced Concrete Pipe, Filter Media Products, Vitrified Clay Pipes & Fittings, submit an acceptable Certificate of Compliance to PWD for each such unit, in accordance with QC-1, QC-2, QC-3, QC-4, QC-6, QC-7, or QC-9 respectively.
- D. Before starting work, submit for approval of PWD, manufacturer's literature describing Epoxy Mortar Gel and Epoxy Bonding Agent. Literature must address each requirement (e.g. Compressive Strength per ASTM C109) as specified.

#### 1.06 MEASUREMENT AND PAYMENT

- A. RCP sewers of the various sizes will be paid for lump sum prices bid for associated work.
  - 1. The price bid shall include the following and all appurtenant work and materials necessary to make a complete structure: furnishing and installing RC pipe, gaskets, 2000 psi concrete cradle, blocking, manufactured bends; making connections; 2000 psi concrete collars; 2000 psi concrete cut-off walls; sealing openings with 9 inch thick brick masonry bulkheads; wye branches, saddles, inserts, and other specials; grout.
- B. Ductile Iron (DI) inlet connections, sewers, and piping of the various sizes will be paid for at the lump sum prices bid for associated work.



1. The price bid shall include the following and all appurtenant work and materials necessary to make a complete structure: furnishing and installing DI pipe with gaskets and fittings; making connections; and 2000 psi concrete collars.
- C. VCP inlet connections will be paid for at the lump sum prices bid for associated work. VCP vent connections will be paid for as a lump sum as part of Furnish and Installation of Site Utilities. VCP lateral connections of the various sizes will be paid for as a lump sum as part of Furnish and Installation of Site Utilities.
1. The price bid shall include the following and all appurtenant work and materials necessary to make a complete structure: furnishing and installing VC pipe with gaskets; core drills; rubber saddles; making connections; 2000 psi concrete collars; concrete cutoff walls (in the instance of an existing brick sewer); manufactured bends; sealing openings with nine inch (9") thick brick masonry bulkheads; Class D bedding; wye branches, stoppers, and other specials.
- D. Manholes (including wellholes) of the various types will be paid for at the lump sum prices bid for associated work.
1. The price bid shall include the following and all appurtenant work and materials necessary to make a complete structure: excavation, furnishing and installing brick work with mortar, or cast-in- place concrete of the indicated strength, or precast reinforced concrete sections with rubber gaskets; formwork; finishing concrete surfaces; gray iron frames and covers; aluminum or plastic steps; broken stone base; VC specials; brick wedges; eyebolts; drip rings or drip slabs; base slabs; epoxy coating; resilient connectors or non-shrink, non- metallic mortar; concrete fillet.
- E. Inlets of the various sizes and types will be paid for at the lump sum prices bid for associated work.
1. The price bid shall include the following and all appurtenant work and materials necessary to make a complete structure: furnishing and installing brick work and mortar, or cast-in- place concrete of the strength indicated, or precast reinforced concrete sections with rubber gaskets; inlet frames and grates; cleanout covers and frames; inlet traps with gaskets; brick masonry adjustments; formwork; curb nosing; excavating, backfilling, and compacting; removing existing inlet; parging interior seams and fittings with non-shrink grout; restoring existing paving and curb; lifting inserts; removing existing inlet castings, and hauling and delivering them to the Water Department Storage Yard.
    - a. Price bid shall include on-site coring of inlet boxes required to install HDPE/PP/DI/PVC outlet connections to stormwater storage systems at precise elevations and underdrain connections with PVC and watertight boot collars as shown on the Drawings. No additional payment shall be made for installation of these connections on new inlets; connection to existing inlets shall be paid under the unit price bid for each.
  2. The price bid shall also include the filling of an abandoned inlet if the excavation for the proposed inlet encroaches into an existing inlet structure including the following and all appurtenant work and materials: removing inlet top to a depth of one foot; removing cleanout cover and frame, grate and frame, and trap, and delivering to Water Department Storage yard; sealing pipe outlet with nine inch (9") thick brick masonry bulkhead; filling trap with Ordinary Backfill Material; and paving restoration.
  3. Also included in the price bid shall be the replacement of three (3) square yards of footway paving and six (6) linear feet of curb.

- F. Green inlets (connected only to green stormwater infrastructure) of the various sizes and types, as seen on Drawings, will be paid for at the lump sum prices bid for associated work.
  - 1. The price bid shall include the replacement of three square yards of footway paving, six linear feet of standard curb and any standard or modified curb section above the grate and frame as seen on Drawings.
  - 2. The price bid shall include spare parts as outlined in sub-section 3 (Execution) of this section.
  - 3. The price bid shall include a plumber's plug to be installed in the distribution pipe. Plug must remain in place to be removed by PWD after construction. PWD will not return plug.
  - 4. The price bid shall include on-site coring of inlet boxes required to install HDPE/PP outlet connections to stormwater storage systems at precise elevations as shown on the Drawings.
  - 5. The price bid shall include reflective green inlet curb marker, located as shown on Drawings.
  - 6. The price bid for Green City Inlets shall include concrete apron and a trash or debris screen to be installed over the distribution pipe, unless otherwise indicated on Drawings.
- G. Trench drains will be paid for at the lump sum prices bid for associated work. The price shall include all required work to construct the channel, frame, grate, bolts, concrete apron and any paving adjustment necessary to install the trench drain.
- H. Stormwater junction boxes, overflow structures, and control structures will be paid at the lump sum prices bid for associated work. The price shall include all installation and grading as specified and as may be shown on the Contract Drawings, including but not limited to, traps, weir wall with orifice, permanent inlet protection, grates, frames, lids, manholes, lockable bolts, connections to stormwater piping, preparation of subgrade, or other appurtenant structures or work.
- I. Curb cuts and curb openings used for stormwater management will be paid for at the lump sum prices bid for associated work.
  - 1. Installation of cast-in-place concrete, precast concrete or sawcutting of existing curbs to create the dimensions of the curb cut or curb opening as defined in the Drawings, precast or cast-in-place concrete apron as defined in the Drawings, metal wheel guards with bolts and attachments required to secure the wheel guard, and all footway or cartway paving necessary to create a compliant cut, depressed curb sections and transitions.
- J. Filling abandoned inlets will be paid for at the lump sum prices bid for associated work.
  - 1. The price bid shall include the following and all appurtenant work and materials: removing inlet top to a depth of one foot; removing cleanout cover and frame, grate and frame, and trap, and delivering to Water Department Storage Yard; sealing pipe outlet with nine inch (9") thick brick masonry bulkhead; filling trap with Ordinary Backfill Material; and paving restoration.
  - 2. No separate or additional payment will be made for filling of abandoned inlets that are included in the Proposal Item for new inlets.
- K. Flowable fill (control density fill) for filling abandoned pipe will be paid at the lump sum prices bid for associated work.
  - 1. The price bid shall include the following and all appurtenant work and materials: furnishing and placing flowable fill; sealing ends with 9 inch thick brick masonry bulkheads.

- L. Underdrain connections to existing inlets from stormwater facilities will be paid for as a lump sum as part of Furnish and Installation of Site Utilities. Bid price shall include any additional excavation required, core-cutting a hole into the existing inlet box at the specified elevation, installing the pipe as shown on the Drawings, installing watertight boot collar attached to PVC pipe, and any and all appurtenant and relevant work to complete the structure. See Section 02707 and 02709 for details. No payment shall be made for connection to inlets newly installed under this Contract; such connections (including all facets of installation) shall be included in the price bid for the relevant inlet structure.
- M. Concrete pavement warping or concrete aprons, if specified on the Drawings for installation with City and Open Mouth Grate inlets, will be included as part of the lump sum bid for the associated inlet. No additional payment shall be made for the forming, placing, or finishing of the aprons or warping as shown on the Drawings.
- N. Abandonment of inactive sewer laterals will be paid for at the lump sum prices bid for associated work. The price bid shall include over-excavation of the GSI trench as specified, removal of lateral pipe within trench limits, suitable backfill material below the sand layer of the GSI trench, sealing lateral pipe outlet with plug and non-shrink grout, concrete bulkhead, and all other appurtenant work per plans/detail sheet.

## PART 2 PRODUCTS

2.01 See PWD Standard Details and Standard Specifications for Sewers, unless otherwise noted below.

### 2.02 BACKFILL

- A. Ordinary Backfill Material may include all material excavated from the trench and free of objectionable matter unless rejected by PWD. The Contractor shall furnish any deficiency of Ordinary Backfill Material.
- B. Furnish Select Backfill Material in accordance with PennDOT Publication 408 Specifications, Section 703.3, Select Granular Material-2RC (as amended). The use of slag as Select Backfill Material is hereby prohibited.

### 2.03 RUBBER SADDLES

- A. Rubber Saddles for Lateral Connections to RC Pipe Sewers shall be manufactured from a blend of rubber that is laboratory tested and appropriate for sewer applications.
- B. Pipe clamps and expansion rings shall be Type 304 Stainless Steel.
- C. Rubber Saddles shall provide a watertight connection and be compatible with ASTM C923.

### 2.04 DUCTILE IRON (DI) DRAINAGE PIPE

- A. DI pipe shall be Class 56 for pipe of twelve inches or less ( $\leq 12''$ ) in nominal diameter, and Class 54 for nominal diameters greater than twelve inches ( $> 12''$ ).
- B. Pipe shall conform to the Standard Specifications for Ductile Iron Pipe of PWD.

### 2.05 LOCKABLE BOLTS

- A. Locking bolts: Stainless steel machine head bolts with countersunk hex key. Bolts shall be installed clean and free of grit or debris and coated using white lithium grease or equivalent metal-to-metal lubricant and rust protector prior to initial installation.

## 2.06 GREEN INLET

- A. All green inlets shall be installed with standard PennDOT precast concrete inlet box (PennDOT RC-46M) unless otherwise shown on Drawings.
- B. Standard PWD OMG frames and grates shall be used for all green highway grate inlets.
- C. Pavement restoration and design must conform to current Philadelphia standards for City streets and PennDOT standards for state routes.
- D. Outflow pipe (distribution to GSI system) will be sealed with a plumber's plug. The plug will be PWD property to be removed by PWD.

## 2.07 GREEN INLET CURB MARKERS

- A. DAS Manufacturing "Duracast 2 ½" Custom reflective one color Curb Marker" or approved equal. Marker to match logo, size, and color presented in Appendix E Green Inlet Curb Marker Detail.
- B. DAS Manufacturing Curb Marker Adhesive #RS-222-5 / #RS-222-11 or approved equal must be used to attach marker to curb.

## 2.08 GREEN DUAL CATCH BASIN INLETS

- A. All green dual catch basin highway grate inlets shall be installed with standard PWD six (6) foot OMG frames and grates.
- B. Weir for dual catch basin city inlet must be cast in place.

## 2.09 TRENCH DRAIN CHANNEL, COVER AND FRAME

- A. All trench grates installed in the footway shall be ADA and AASHTO H-20 compliant. All trench drain channels shall be cast-in-place concrete unless otherwise specified on the Drawings or approved by PWD.
- B. Bolted trench drain channel, cover and frame shall be installed as indicated on the Drawings. Locking bolts shall be stainless steel machine head bolts with countersunk hex key. Bolts shall be installed clean and free of grit or debris and coated using white lithium grease or equivalent metal-to-metal lubricant and rust protector prior to initial installation.
- C. Steel reinforcement for trench drain channels shall be installed as specified on the Drawings.
- D. Trench drain grates shall be installed with the pattern specified on the Drawings. If no specified product is indicated on the Drawings, the trench drain system shall be the Neenah R-4999 series with river walk pattern or approved equal.

## 2.10 PRECAST CONCRETE CONTROL STRUCTURES

- A. All precast concrete catch basins used for overflow control structures shall have a minimum specified compressive strength of 4,000 pounds per square inch (psi) per ACI 318 / ASTM C39 unless otherwise specified. All concrete shall conform to PWD's Standard Specifications for Precast Concrete.
- B. All control structures 48 inches in diameter and larger shall include steps per standard PWD sewer specifications.
- C. Cast-in-place catch basin bases shall have a 28-day compressive strength of 3,500 psi unless otherwise noted.

- D. When connected to existing PWD sewers, catch basin traps for overflow control structures shall be Neenah Foundry series R-3705 or approved equal. For control structures not directly connected to existing sewers, traps should be installed as per Drawings.

## 2.11 PERMANENT INLET PROTECTION

- A. Permanent inlet protection for green highway grate inlets shall be the StormSack-PWD Type M Green Inlet Protection System, as manufactured by Fabco Industries/ACF Environmental or approved equivalent. Product shall have the following properties (minimum):

- 1. Sediment bag

- a. Flow rate: 145 gallons per minute per square foot (gpm/sf)
- b. AOS: 40 (sieve size)
- c. Puncture Strength: 750 pounds
- d. Filtration Efficiency: 82%
- e. Capacity: 4.5 cubic feet (cf)
- f. Mesh liner to guard against shovel strikes during cleanout operations

- 2. Frame

- a. Stainless steel or aluminium construction
- b. Minimum two-inch (2in) adjustability in both length and width
- c. Integral lifting points

- B. Permanent inlet protection for Green City Inlets shall be the StormSack-PWD Type P Green Inlet Protection System, as manufactured by Fabco Industries/ACF Environmental or approved equivalent. Product shall have the following properties (minimum):

- 1. Sediment bag

- a. Flow rate: 145 gallons per minute per square foot (gpm/sf)
- b. AOS: 40 (sieve size)
- c. Puncture Strength: 750 pounds
- d. Filtration Efficiency: 82%
- e. Mesh liner to guard against shovel strikes during cleanout operations.
- f. Supported by a collection pan/support assembly and located directly under the manhole cover for inspection and maintenance access.
- g. The sediment bag assembly shall be able to be removed through the manhole when full using integral lifting straps.

- 2. Collection pan/filter support assembly

- a. Stainless steel or aluminium construction
- b. Capable of being installed in the City Inlet without removing the precast top slab. Therefore all parts must fit through a minimum 18.5-inch diameter manhole opening or a 1.5-inch x 48-inch curb mouth opening.

c. Able to be mounted to irregular walls, ledges or other-than flat concrete surfaces commonly found inside City Inlet precast structures.

C. Permanent inlet protection used for green dual catch basin highway grate inlets shall be the StormSack-PWD Green Inlet 6-ft Dual Filter Protection System, as manufactured by Fabco Industries/ACF Environmental or approved equivalent. Product shall have the following properties (minimum):

1. Sediment bag

a. Flow rate: 145 gallons per minute per square foot (gpm/sf)

b. AOS: 40 (sieve size)

c. Puncture Strength: 750 pounds

d. Filtration Efficiency: 82%

e. Mesh liner to guard against shovel strikes during cleanout operations

f. Removable from deflector pan

2. Deflector pan

a. Bridges the center weir wall and slopes towards removable sediment bag

b. Stainless steel or aluminium construction

c. Minimum two-inch (2in) adjustability in both length and width

D. Trash and Debris Screen

1. Where called out on inlet details, a trash or debris screen shall be installed over the distribution pipe.

2. Trash or debris screen shall be installed according to manufacturer's recommendations. At a minimum, the screen shall be installed with vertical rails on the catch basin wall, centered over the outlet pipe, and allow for the screen to be removed for cleaning. If no trash screen is identified on the drawings, the trash screen shall be TrashGuard "Plus" for underground storage systems, product number TGRD23X24S, screen size 23", as manufactured by Trash Guard, Inc. or approved equivalent. TrashGuards shall be cut by the manufacturer to fit through the inlet manhole and shall be reassembled within the inlet by the Contractor.

2.12 WATERTIGHT BOOT COLLAR FOR UNDERDRAIN CONNECTION TO CATCH BASINS

A. Watertight boot collars shall be Kor-N-Seal 106-406 Series connectors or approved equal.

2.13 EPOXY GROUT FOR PIPE CONNECTIONS TO CATCH BASINS

A. Acceptable Manufacturers

1. The following products are acceptable as Epoxy Mortar Gel, provided they continue to meet all requirements:

a. Meta Bond HM Gel, as manufactured by American Meta Seal Company, 509 Washington Avenue, Carlstadt, NJ 07072.

b. Sikadur 31 Hi-Mod Gel, as manufactured by Sika Corporation, Box 297, Lyndhurst, NJ 07071.

- c. Thermal-Chem Mortar Resin Gel (Product No. 304), as manufactured by Thermal-Chem, Inc., 1400 Louis Avenue, Elkgrove, IL 60007.
  - d. Approved equivalent product.
2. The following products are acceptable as Epoxy Bonding Agent, provided they continue to meet all requirements.
- a. Meta Bond HM, or Meta Bond HM Gel, as manufactured by American Meta Seal Company.
  - b. Sikastix 370, Sikadur Hi-Mod, or Sikadur 31 Hi-Mod Gel, as manufactured by Sika Corporation.
  - c. Thermal-Chem Mortar Resin (Product No. 3), or Thermal-Chem Mortar Resin Gel (Product No. 34), as manufactured by Thermal-Chem, Inc.
  - d. Approved equivalent product.

B. Materials

1. Epoxy Mortar Gel shall:
- a. Be a 100% solids formulation.
  - b. Have a Tensile Strength per ASTM D638 not less than 3000 psi after 7 days at 73°F.
  - c. Have a Tensile Elongation per ASTM D638 not over 7%.
  - d. Have a Compressive Strength per ASTM D695 not less than 3000 psi after 24 hours at 73°F, and not less than 6000 psi after 7 days at 73°F.
2. Sand shall:
- a. Be oven-dry silica sand.
  - b. Have at least 70% by weight pass #20 sieve.
  - c. Have not over 35% by weight pass #40 sieve.
3. Epoxy Bonding Agent shall meet the requirements for Epoxy Mortar Gel.

C. Mixes

1. Epoxy Mortar shall consist of Epoxy Mortar Gel and Sand mixed at a 1:1 ratio by loose volume.

2.14 WHEEL GUARDS

- A. Wheel guards shall be steel plate with a minimum tensile strength of 35,000 psi and in conformance with PWD Standard Specifications for Gray and Ductile Iron.
- B. Bolts and attachments shall be stainless steel (Grade 304 or 316), with countersunk hex key. Bolts shall be installed clean and free of grit or debris and coated using white lithium grease or equivalent metal-to-metal lubricant and rust protector prior to initial installation.
- C. Wheel guards shall extend a minimum of 6 inches on either side of the curb cut and shall be a minimum of ½ inch in thickness.

2.15 CONCRETE APRONS

- A. Aprons shall be cast-in-place concrete unless otherwise specified on the drawings or approved by PWD.
- B. Aprons in the street shall not have slopes in excess of 15% and shall not extend more than 3 feet into the cartway. Concrete aprons shall have a minimum of an 8" base.
- C. All concrete to be used for concrete aprons shall have a minimum specified compressive strength of 3,500 pounds per square inch (psi) per ACI 318 / ASTM C39 unless otherwise specified. All concrete shall conform to PWD's Standard Specifications for Masonry Concrete.

## PART 3 EXECUTION

### 3.01 MAINTENANCE AND PROTECTION OF TRAFFIC DURING CONSTRUCTION

- A. Maintain and protect traffic during construction as required elsewhere in these Contract Documents (See Section 01570, Traffic Regulation).

### 3.02 EXCAVATING

- A. See Section 02210 Earthwork. Excavate in accordance with the Standard Specifications for Excavation, Refilling, Grading, Landscaping, and Repaving. Excavation will not be classified, whether by type of material encountered, or by type of equipment required.
- B. Use sheeting and shoring sufficient to avoid damage to or settlement of adjacent buildings, paving, and underground structures.
- C. Protect from damage and provide adequate temporary support for all existing underground facilities, except those known to be abandoned. Repair any damage to existing underground facilities due to Contractor's operations without charge to City.
- D. Remove existing inlet grates and frames, CI sewer manhole frames and covers, and inlet traps and deliver them to Water Department Storage Yard at Fox Street and Abbottsford Avenue.
- E. Use of a Hydro-Hammer or similar equipment is hereby prohibited.

### 3.03 CONCRETE CUT-OFF WALLS

- A. Before removing the earth fill over the arch of the existing sewer, construct a concrete cut-off wall where called for on the Contract Drawings.
- B. The cut-off wall shall be constructed across the entire width of trench down to the spring line of the sewer. After the cut-off wall has been constructed and set, the remaining portion of earth over the sewer shall be removed down to the spring line.

### 3.04 DEBRIS GRILLS

- A. Take great care when breaking the sewer crown to prevent debris from being washed down the sewer.
- B. At the end of each work day, cover the open end of the sewer with a metal debris grill to prevent debris from being washed down or thrown into the sewer during non-work hours. At the beginning of each work day, remove all accumulated debris before removing the debris grill.
- C. Employ a rigid, portable metal debris grill which is sufficiently strong to withstand the impact of any debris which may be washed down stream or thrown against it. Openings shall be three inches square (3" x 3").



- D. During working hours, prevent any debris, construction material, or equipment from being washed down the sewer. Remove any such material from the sewer without charge. Use debris grill during working hours when feasible.

3.05 FLUMING AND PUMPING

- A. Flume the existing sewer flow during construction. Use only such dams as will not restrict full flow during storms. Repair all damage due to restriction of flow.

3.06 DIVERSION OF FLOWS

- A. The Water Department does not guarantee the ability to dam or divert flows. The Water Department shall approve all damming and diverting of flows prior to their inception.
- B. One week prior to damming and diverting of any flow the Contractor shall notify both of the following:
  - 1. Sewer Maintenance Superintendent at 215-685-2034.
  - 2. Flow Control Superintendent at 215-685-2004.
- C. In addition, both Sewer Maintenance and Interceptor Services shall be notified one week prior to removal of any dam and the resumption of flow. Upon completion of the removal of the dam, the Contractor shall schedule an inspection of the sewer at the location of the dam. Any damage found during this inspection shall be repaired by the Contractor at no additional cost to the City.
- D. If for any reason, it becomes necessary to remove the dam prior to completion of the project, the Contractor shall remove the dam, restore flow, and utilize an alternate means of flow control to complete the project, at no additional cost to the City.

3.07 RODENT CONTROL

- A. Rodent control measures shall be in accordance with the "Philadelphia Rat Control Project Guidelines for Eradication and Control in Demolition's and Excavations". A copy of these guidelines can be obtained by calling the Philadelphia Department of Public Health; Vector Control Services, at 215-685-9009 or 215-685-9000.
- B. A minimum of one pound (1 lb.) of water resistant bait and rodenticides approved by the EPA for use in sewers shall be hung by a galvanized tie wire at the springline of the sewer or on the shelf of the manholes within and around the sewer reconstruction as indicated on the attached rodent control plan. All rodent control measures shall be in place fourteen (14) days prior to excavation except in emergency situations, whereas the measures shall be in place within twenty-four (24) hours of the Notice to Proceed.
- C. The bait or rodenticide is a one pound (1 lb.) block CONTRAC Super-Size BLOX. This rodenticide bait is produced by Bell Laboratories, Inc. Following is a list of local distributors:

Univar USA	Ehrlich J C Company INC.
850 Calcon Hook Road	500 Spring Ridge Drive
Bay #9	Wyomissing, PA 19160
Sharon Hill, PA 19079	800-488-9495
(610) 237-8402	(610) 374-2200

- D. There are various products on the market that serve the same purpose, however very few are made for sewer application, and many are multi-feeder which are not as effective as single feeder. Therefore, any substitutions shall be submitted to PWD for approval.
- E. The Contractor shall inspect the rodent control measures once every week or after each rain event whichever is shorter. All rodent control measures in manholes both within and around the limits of sewer reconstruction shall be maintained throughout the duration of the project. Manholes within the limits of sewer reconstruction shall include existing manholes and new manholes once the base section has been constructed. Payment for this work shall be included in the price bid for sewer excavation.

### 3.08 INSTALLATION

- A. Construct sewers, stormwater conduits, inlet connections, vents, lateral connections, and risers; manholes, wellholes, and inlets; concrete cradles, collars, cutoff walls, headwalls, and endwalls; RC box sewers, chambers, and flares in accordance with the 1985 Standard Details and Standard Specifications for Sewers, and the Contract Drawings and Special Specifications.
- B. All inlets shall be constructed to provide positive drainage. All associated pavement restoration shall be sloped inwards towards the inlet, and the inlet grate or throat as appropriate shall be slightly below the surrounding continuous street slope. No inlet may be constructed such that its function is restricted, and PWD reserves the right to refuse payment on any inlet that does not provide positive drainage. This may include, but is not limited to, inlets that do not meet the minimum throat opening requirements of three inches (3”) after final paving and surfacing is complete, or inlets whose grate is higher than the surrounding paving surface.
- C. When connecting VCP laterals that do not require the use of a wye branch to RC Pipe, the openings shall be created with a core drill. The Standard Detail for Saddle Connections to RC Pipe Sewers within the 1985 Standard Details and Standard Specifications for Sewers shall be modified so that rubber saddles shall be substituted for clay saddles. The rubber saddles shall be expanded against the wall of the pipe to provide a watertight connection. The lateral pipe shall be secured within the saddle through the use of a stainless steel clamp. The 2000 psi concrete encasement shall be extended to the cradle of the sewer as shown in the Detail for Resilient Saddle Connection to RC Pipe Sewers affixed to the end of these specifications.
- D. Make provisions for future connections in accordance with Water Department standards.
- E. Do not construct any new inlet until the location has been approved in the field by Construction Branch. Should the Contractor construct any inlet without first receiving such approval, full responsibility for that work is assumed by the Contractor, and shall if so directed reconstruct that inlet in another location without charge to the City.
- F. When connecting new VCP laterals to existing laterals, make joints with a 1:3 grout, making a full, closed joint between the pipes.
- G. Seal all remaining openings with nine inch (9”) thick brick masonry.
- H. Do not make holes in RC Pipe for lifting. Use only padded slings to lift RC pipe sections. Take care not to damage pipe surface, bell, or spigot.
- I. Connections to HDPE/PP pipe for stormwater storage systems shall be constructed such that positive drainage is created (unless otherwise directed on the Drawings). On the upstream (distribution) connection, on-site coring of the inlet box is suggested to ensure maintaining the correct or appropriate elevations. A standard PWD inlet trap shall only be employed when

explicitly directed on the Drawings. The downstream (underdrain) connection must be made with a watertight boot collar, and precise elevations as shown on the Drawings shall be maintained. Connections should be watertight.

- J. All trapped inlets and overflow control devices shall be primed with water so that no sewer gases can escape from the inlet or overflow control device.
- K. Any orifice cap must be installed on all underdrains such that the center of the cap is a minimum of 7.5" above the trapped outlet to the sewer, unless otherwise indicated on the Drawings, and to provide positive drainage from the stormwater storage system. On-site coring of the inlet box is suggested to ensure that the correct or appropriate elevations are maintained. Any major spalling caused by core-cutting the inlet box shall be repaired by the Contractor. Underdrain connections must be made with a watertight boot collar.
- L. The Contractor shall not drill the orifice until authorization is received by PWD GSI Implementation Unit. Any deviation of orifice elevation from that shown on the Drawings shall be approved by PWD prior to installation. It should be noted that the Contractor may be directly to maintain a solid cap if test results and PWD GSI Implementation Unit indicate conditions favorable for infiltration.
- M. Within the limit of street reconstruction and within the limit of full width street resurfacing the contractor shall be responsible for maintaining a minimum three inches (3") curb opening to all open mouth style inlets and trench drains. The Contractor shall install concrete aprons at all curb-opening stormwater collection points (city inlets, lay-by inlets, trench drains, etc.) as shown on the Drawings, or the Contractor when necessary shall dish out the asphalt around the inlet opening, to accommodate the minimum three inch (3") curb opening. This work is incidental to paving items, and no separate or additional payment will be made for this work.
- N. The Inlet protection (permanent and temporary) shall be installed according to the manufacturer's specifications.

### 3.09 GREEN INLET INSTALLATION

- A. Construct modified green inlets to the dimensions, shape, and workmanship as shown in the Drawings, or as otherwise directed by PWD.
- B. Pipe openings will be located to provide a minimum of four inches (4") of concrete between inlet box and pipe opening.
- C. Height of inlet box shall be a minimum of three and a half (3 ½) feet and a maximum of eight (8) feet.
- D. The grate of the inlet should be no more than ½" offset with the adjacent curb.
- E. Minimum cover for thermoplastic pipe within the public right-of-way must be two (2) feet.
- F. Contractor will install watertight plumber's plug within all distribution pipes. Plug must remain in place until removed by PWD.
- G. Prior to installation, the subgrade must be compacted and carefully graded such that the inlet meets the proper elevation as shown on the Contract Drawings.
- H. Reflective green inlet curb marker will be located as shown on Drawings and installed according to the manufacturer's specifications. Weather must be dry for 24 hours before and after installation, and markers may only be placed when the temperature is above 45°F.

### 3.10 INSTALLATION OF TRENCH DRAINS/GRATES

- A. Construct trench drains to the dimensions, shape, and workmanship as shown on the Drawings, or as otherwise directed by PWD.
- B. Top of grate must be installed flush to 0.125 inches below finished grade. Bevel concrete to top of grate if below flush. Grate inflow areas shall be a minimum of 0.25 square feet per linear foot. The grate bars shall be transverse to the roadway and bicycle safe. Grates shall have openings no greater than ½ inch wide.
- C. Contractor may install temporary cold-patch asphalt upstream of each trench drain.
- D. Contractor may install tubular sediment control device at the upstream and downstream end of each trench drain.
- E. The use of Styrofoam and caulk to restrict flow into trench drains may be utilized only if approved by PWD.

### 3.11 INSTALLATION OF CONCRETE CURB CUTS AND APRONS

- A. Construct concrete curb cuts and aprons to the dimensions, shape, and workmanship as shown on the Drawings, or as otherwise directed by PWD.
- B. Curb cut aprons shall be a minimum of 18 inches wide, measured perpendicular to the curb, unless otherwise indicated on Drawings, and shall have a minimum drop of 2 inches from the projected gutterline.
- C. Construct or replace curbs to the dimensions, shape, and workmanship as the original curb, as shown on the Drawings, or as otherwise directed by PWD. Construction methods shall be in accordance with PennDOT Pub. 408, Section 630. Paving limits shall be in accordance with Streets Department Detail L-892, which dictates a minimum cartway and footway replacement width inherent to curb reconstruction.
- D. Installation of curbing shall be performed in a manner that does not compromise the integrity of any stormwater system. In no instances will it be acceptable to stake, pierce, or otherwise damage an installed or existing system to facilitate curb cut construction. It is suggested that all curbing be formed using top-clamped forms or slipforming methods, and all surveying grades be marked with tautlines spanning the underlying systems.
- E. Where curb is disturbed outside of those areas shown on the drawings or otherwise specified, restore in kind, to extent determined by PWD, and to the satisfaction of the abutting property owners.
- F. Where not otherwise directed to replace the existing curbing, or where not required to replace the existing curbing due to construction activities, the Contractor shall maintain and support the existing curbing and footway as necessary during all construction activities.
- G. For any length of curbing more than twenty continuous linear feet to be restored, the Contractor shall be solely responsible for contacting the appropriate Streets Department Survey District and request any necessary lines and grades to be set. No additional payment shall be made for coordination with Streets Survey, or any delays to the Work resulting from said necessary coordination.
- H. Within the limit of street reconstruction and within the limit of full width street resurfacing the contractor shall be responsible for maintaining a minimum three inches (3”) curb opening to all open mouth style inlets. The Contractor shall install concrete aprons at all curb-opening

stormwater collection points (city inlets, lay-by inlets, trench drains, etc.) as shown on the Drawings, or the Contractor when necessary shall dish out the asphalt around the inlet opening, to accommodate the minimum three inch (3”) curb opening. This work is incidental to paving items, and no separate or additional payment will be made for this work.

- I. Prior to installation, the subgrade must be compacted and carefully graded such that the concrete apron slab will be seated flush on the subgrade, at the proper elevation and slope as shown on the Contract Drawings.

### 3.12 MAKING PIPE CONNECTIONS TO CATCH BASIN

- A. Make hole(s) in existing structure as necessary to permit connection. Core through existing concrete structures and cut reinforcing as necessary. Remove all dirt, laitance, and other loose or undesirable material from mating surfaces. Check hole(s) for fit.
- B. Comply fully with manufacturer’s instructions. Coat mating surfaces with Epoxy Bonding Agent and set pipe. Seal all openings with Epoxy Mortar. Support pipe securely to prevent movement and protect for at least 24 hours.

### 3.13 ABANDONMENT OF SEWER LATERALS

- A. Laterals to be abandoned as shown on plans/detail sheet.

### 3.14 PERMANENT INLET PROTECTION

- A. All stormwater inlets that are directly connected with and tributary to subsurface stormwater storage units (Green Inlets, labeled as “G” on the Drawings, and domed risers) shall be protected with both temporary measures as specified above and permanent measures as shown on the Drawings (or barring inclusion in the Drawings, as specified herein).
- B. Additional replacement parts (one of each item scheduled for replacement as part of annual maintenance per the manufacturer) shall be delivered to the PWD GSI Maintenance Garage. Refer to subsection 3.15 for address.
- C. Installation of permanent inlet protection shall be in accordance with the manufacturer’s recommended installation procedures.
- D. Permanent inlet protection shall not take the place of temporary inlet protection in any case. Green inlets (to receive permanent inlet protection) shall remain fully closed to runoff until final site cleanup. Cleaning of green inlets as part of final site cleanup shall include cleaning any installed permanent inlet protection devices.

### 3.15 BACKFILLING AND COMPACTING IN CITY STREETS AND STATE ROUTES

- A. See Section 02210 Earthwork.

### 3.16 INSPECTION

- A. Should PWD order City forces to inspect the sewer system using closed-circuit television equipment, the Contractor shall cooperate fully with the City forces in order to facilitate the inspection.

### 3.17 REPAVING

- A. Restore all disturbed paving, curb, and grass areas as required elsewhere in the Contract Documents (See Section 02500, Paving and Surfacing).

### 3.18 SPARE PARTS

- A. Contractor shall provide one (1) spare permanent inlet protection sediment bag per installed inlet filter location, one (1) extra hardware kit consisting of any sack locking bars/screws/wing nuts used to fasten permanent inlet protection sediment bag components per installed inlet filter location; one (1) additional trash/debris screen per installed location, and one (1) extra hardware kit consisting of washers, screws, pins, and other components needed to mount trash/debris screen on rails per installed location, as well as any other replacement parts mandated by the Specifications. For tracking purposes, quantities of each spare part item are documented in Appendix H. Spare parts shall be delivered to the PWD GSI Maintenance Garage at the address below. No additional payment will be made for the provision, installation, or delivery of permanent inlet protection.

Attn:  
Edward Force  
Cell: 267-909-0151  
PWD Collectors System Yard  
Fox Street and Abbottsford Avenue  
Philadelphia, PA 19129

END OF SECTION

SECTION 02707  
THERMOPLASTIC DRAINAGE PIPE AND FITTINGS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to install solid and perforated corrugated high density polyethylene (HDPE), polypropylene (PP) pipe or polyvinyl chloride (PVC) pipe and/or structures and appurtenances as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Section 02210 Earthwork
- B. Section 02370 Geosynthetics
- C. Section 02700 Sewerage and Drainage
- D. Section 02709 Subsurface Stormwater Storage
- E. Section 02720 Stormwater Surface Features

1.03 SUBMITTALS

- A. Submit a list of materials to be provided for work under this Section for any products not covered under PWD Quality Certification Standards. Include the name and address of the materials producer, the location from which the materials are to be obtained, part numbers, and shop drawings.
- B. Certificates of Compliance: Before installation of any Thermoplastic Pipe or Fittings, submit an acceptable Certificate of Compliance to PWD for each such unit, in accordance with QC-13.
- C. In the event of unavailability of a specified product from any and all approved manufacturers, submit both certification of unavailability and shop drawings showing details of pipe, fittings, joints and construction methods from an alternate source.

1.04 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials (AASHTO)
  - 1. AASHTO M-252 - Standard Specification for Corrugated Polyethylene Pipe (4-in to 10-in)
  - 2. AASHTO M-294 - Standard Specification for Corrugated Polyethylene Pipe (12-in to 36-in)
- B. ASTM International
  - 1. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Application.
  - 2. ASTM F2306 – Standard Specification for 12 to 60 in. Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity- Flow Storm Sewer and Subsurface Drainage Applications
  - 3. ASTM F2881 – Standard Specification for 12 to 60in Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications.

4. ASTM D3034 – Standard for Sewer PVC Pipe and Fittings
  5. ASTM F477 – Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
  6. ASTM D3212 – Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
  7. ASTM D1785 – Standard Specification for Polyvinyl Chloride (PVC) Pipe, Schedules 40, 80, and 120.
  8. ASTM D638 - Test Method for Tensile Properties of Plastics.
  9. ASTM D695 - Test Method for Compressive Properties of Rigid Plastics.
  10. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
- C. Philadelphia Water Department Quality Certification Standards (QC)
1. QC-2 Standards for Gray/Ductile Iron Castings
  2. QC-13 Standards for Thermoplastic Pipe and Fittings
- D. Where reference is made to one of the above standards the revision in effect at the time of bid opening shall apply.

#### 1.05 QUALITY ASSURANCE

- A. All pipe, fittings, cleanout covers, domed riser grates and frames, and other products shall be installed to ensure a minimum loading capacity in accordance with H-20 loading, as required by Philadelphia Department of Streets. Any deviation from manufacturer's specifications for product installation (without approval by manufacturer or signed and sealed statement of adequacy by Professional Engineer) is prohibited.
- B. Thermoplastic pipe and fittings shall be provided by a certified manufacturer listed under PWD Quality Control Standard (QC) 13. In the event a specific part is neither available nor manufactured by the approved suppliers, shop drawings shall be submitted for approval by PWD prior to installation.
- C. All pipe installed under this Section shall be clean at time of installation. The Contractor shall be responsible for ensuring no dirt, debris, or other foreign material is on any surface of the piping immediately prior to installation. Piping installed that is found to contain debris shall be refused, and (in the event of clean stone bedding) the entire trench shall be removed and replaced in its entirety at no cost to the City.

#### 1.06 MEASUREMENT AND PAYMENT

- A. Perforated HDPE/PP pipe will be paid for at the lump sum prices bid for associated work and shall include all materials and appurtenant work, including joints, bends and fittings necessary to construct the piping as shown on the Drawings.
- B. Solid HDPE/PP pipe will be paid for at the lump sum prices bid for associated work and shall include all materials and appurtenant work, including furnishing and placing pipe bedding and all fittings and fixtures necessary to construct the piping as shown on the Drawings.
- C. Riser structures will be paid for at the lump sum prices bid for associated work and shall include all materials and appurtenant work, including pipe bends, sump, fittings, domed riser grate and



frame, lockable bolts, concrete collar with rebar to support frame as indicated on Drawings, backfill needed to secure and stabilize riser structure, provision and installation of permanent domed riser protection at each domed riser, and provision of spare parts as outlined in subsection 3 (Execution) of this section.

- D. All additional fittings and fixtures, including but not limited to cleanout pipes, cleanout frames and lids, reducers, wyes, bends and other standard fittings, and related products or work to complete the HDPE/PP piping system, will be included at the lump sum prices bid for associated work. No additional payment shall be made for related items under this Section.
- E. No additional payment shall be made for the provision and installation of detectable underground utility marking tape as specified herein. The Contractor shall include any costs for detectable underground marking tape in the related bid items to be marked out (piping, storage trench, etc.).

## PART 2 PRODUCTS

### 2.01 CORRUGATED HDPE OR PP PIPE AND PVC PIPE AND FITTINGS

- A. Corrugated HDPE or PP pipe shall have an annular corrugated exterior and smooth inner wall (dual wall pipe). Pipe shall be manufactured by an approved supplier under QC-13.
- B. Corrugated pipe shall be high density polyethylene or polypropylene of the size and type as shown on the Drawings, all manufactured by the same company and shall meet or exceed the following specifications as applicable: AASHTO M-252, AASHTO M-294, ASTM F2306, or ASTM F2881.
- C. Polyvinyl Chloride Pipe shall be Schedule 80 PVC or SDR-17 as a minimum pipe wall thickness.
- D. Backfilling over the pipe shall be to ASTM D2321 or the pipe manufacturer's specifications, whichever is greater. Cover shall be compacted to at least 95 percent of its maximum dry density as determined by ASTM Test D1557, Method D.
- E. Joints shall be watertight according to the requirements of ASTM D3212. Gaskets shall be made of polyisoprene meeting the requirements of ASTM F477. Gaskets shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly.
- F. Fittings shall be polyvinyl chloride (PVC) or high-density HDPE of the size and type as shown on the Drawings; all manufactured by the same company and shall meet or exceed the following specifications as applicable: AASHTO M-252, AASHTO M-294, ASTM F2306, and/or ASTM D3034. Fittings shall have bell and spigot connections that utilize a spun-on or welded bell and valley or saddle gasket meeting the watertight joint performance requirements of ASTM D3212.
- G. Perforated pipe shall have AASHTO Class II perforations. Class II perforations shall be located in the outside valleys of the corrugations, be circular and/or slotted, and evenly spaced around the circumference and length of the pipe. The opening area shall be no less than 0.945 square inches per linear foot (pipe diameters 4 through 10-inches).

### 2.02 CLEANOUTS

- A. Cleanouts shall be PVC structures in all vertical sections, with adapters to horizontal dual wall corrugated HDPE pipe. Drain covers, grates, and frames shall be ductile iron and lockable. See detailed product information below.

1. PVC Schedule pipe - Harvel Plastics or approved equal.
  2. PVC Fitting; Universal Bell Adapter - Nyloplast 7001-110-275 or approved equal.
  3. PVC Fitting, 8" HDPE 1/8 Bend - Nyloplast 0894ST or approved equal.
  4. PVC Fitting, 8" HDPE Wye to 6" PVC - Nyloplast 0802AG or approved equal
  5. Frame and cover; Neenah Foundry Product #19750068 for frame and #19750070 for lid or approved equal. Frame and/or cover to be stamped "PHILADELPHIA WATER" as shown on Drawings. Frame and lid to be lockable by means of stainless steel bolts.
- B. Locking bolts: Stainless steel machine head bolts with countersunk hex key. Bolts shall be installed clean and free of grit or debris and coated using white lithium grease or equivalent metal-to-metal lubricant and rust protector prior to initial installation.

### 2.03 DOMED RISER STRUCTURES

- A. Domed riser structures shall be mated directly to HDPE/PP piping with watertight seals and fittings.
1. Nyloplast 12" Inline Drain, Part # 2712AG or approved equal. For domed riser with sump, Nyloplast 12" Drain Basin, Part # 2812AG or approved equal.
  2. Neenah Inlet Frame and Beehive Grate, Part # R-2560-G/C, or Nyloplast Grate and Frame, Part # 1299CGD-L, or approved equal.
  3. Locking mechanism: Steel cable with one looped end attached to grate bars and another looped end attached to eyebolt set in concrete ring.
    - a. Stainless steel eyebolt, one-and-a-half-inch (1-1/2") minimum eye inside diameter, three-inch (3") shank length with washer and nut at end of shank set into concrete ring.
    - b. 3/16-inch (3/16") thick galvanized steel cable (W.W. Grainger, Inc. item no. 2TAE8 or approved equal). No frayed ends. Appropriate length to function per design plans.
    - c. Loops at ends created by two sleeves (wire rope sleeve for wire rope dia. 3/16" Aluminum Alloy or similar).
  4. For domed riser standpipe, riser sections shall be solid (non-perforated) within the stormwater soil section of the Stormwater Management Practice. Standpipe shall have perforated sump sections within the stormwater trench (uniformly graded stone) section of the Stormwater Management Practice. Length of perforated sump section shall be as shown on the Drawings, but not less than twelve-inches (12"). Perforations shall be one half-inch (0.5") diameter, drilled vertically and radially two-inches (2") apart, on center, and offset one-inch (1") every other row. Bottom cap shall be a twelve-inch (12") diameter solid HDPE cap.

### 2.04 PERMANENT DOMED RISER PROTECTION

- A. Permanent domed riser (inline drain) protection shall be as indicated on the Drawings. If no permanent riser protection product is identified on the drawings, the permanent riser protection shall be the StormSack-PWD Round Grate Inlet Protection System, as manufactured by Fabco Industries/ACF Environmental, or approved equal. Product shall have the following properties (minimum):
1. Sediment bag for 12" domed riser grate:

- a. Filtered flow rate: 145 gallons per minute per square foot (gpm/sf)
- b. AOS: 40 (sieve size)
- c. Puncture Strength: 750 pounds
- d. Filtration Efficiency: 82%
- e. Mesh liner to guard against shovel strikes during cleanout operations

2. Frame

- a. Stainless steel construction
- b. Integral lifting points
- c. Expanding ring system to support inlet protection within inline drain

2.05 DETECTABLE UNDERGROUND TAPE

- A. Detectable Warning Tape shall be six inches wide (6”), 5-mil thickness, with aluminum foil core. Tape shall be printed with an appropriate legend (“Caution: Buried Storm Sewer Below” or as approved) and shall conform to the color standards of the APWA for buried utilities (green for sewer).

PART 3 EXECUTION

3.01 INSTALLATION OF HDPE AND PP PIPE AND FITTINGS

- A. No single piece of pipe shall be laid unless it is straight. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than one-sixteenth of an inch ( $1/16$ ”) per foot of length. If a piece of pipe fails to meet this requirement check for straightness, it shall be rejected and removed from the site.
- B. All pipe shall be examined before laying and no piece shall be installed which is found to be defective. All piping shall be reasonably clean and free of dirt and debris prior to installation. All pipe and fittings shall be thoroughly cleaned before installation.
- C. All piping shall be sound and clean before installation. When installation is not in progress for any length of time, the open ends of the pipe shall be closed by watertight plug or other approved means. Good alignment shall be preserved during installation. The deflection at joints shall not exceed that recommended by the manufacturer.
- D. If any defective pipe is discovered after it has been installed, it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional cost to PWD.
- E. After the excavation is complete to normal grade of the bottom of the trench and bottom preparation according to the Drawings and Specifications is completed, crushed stone bedding shall be placed, compacted and graded to provide firm, uniform and continuous support for the pipe. The pipe shall be laid accurately to the lines and grades indicated on the Drawings.
- F. HDPE pipe and fittings shall be installed in accordance with ASTM D2321 and the requirements of the manufacturer (see “Corrugated HDPE Pipe Installation Guide” from ADS), or as otherwise provided herein or on the Drawings. Blocking under the pipe is not permitted. Bedding shall be placed evenly on each side of the pipe to mid-diameter and hand tools shall be used to force the bedding where needed to give firm continuous support for the pipe. AASHTO #57 aggregate shall then be placed to six inches (6”) above the top of the pipe.

- G. Detectable underground utility marking tape shall be installed over all pipe not otherwise marked (see Section 02709 for pipe within a stone storage trench). The initial three feet (3') of backfill above the bedding shall be placed in one-foot (1') layers and carefully compacted. Generally, the compaction shall be done evenly on each side of the pipe and compaction equipment shall not be operated directly over the pipe until sufficient backfill has been placed to ensure that such compaction equipment will not have a damaging effect on the pipe. Equipment used in compacting the initial three feet (3') of backfill shall be as approved by the pipe manufacturer.
- H. Before any joint is made, the pipe shall be checked to assure that a close joint with the next adjoining pipe has been maintained and that the inverts are matched and conform to the required grade. The pipe shall not be driven down to grade by striking it. The Contractor shall maintain close pipe joints (once made) at all stages of construction activities, such that post-construction inspection of all joints shall demonstrate them to be tight and properly seated. All necessary caution shall be exercised to prevent separation of the pipe joints during installation and backfilling.
- I. Precautions shall be taken to prevent flotation of the pipe in the trench.
- J. When moveable trench bracing such as trench boxes, moveable sheeting, shoring or plates are used to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding and the backfill. Trench boxes, moveable sheeting, shoring or plates shall not be allowed to extend below the top of the pipe. As trench boxes, moveable sheeting, shoring or plates are moved, crushed stone shall be placed to fill any voids created and the backfill shall be recompacted to provide uniform side support for the pipe.
- K. The use of ninety-degree (90°) bend pipe fittings is not permitted in the installation of piping. The Contractor shall use minimum-angle fittings to construct the pipe layout diagrammatically shown in the Drawings. The maximum fitting angle approved for use is forty-five-degrees (45°), and fittings of lesser angles (22½° or 11¼°) are preferred for use where practical.
- L. Anti-seep collars shall be employed as indicated on the Drawings. See Section 02709 Subsurface Stormwater Storage.

### 3.02 CLEANING PIPELINES

- A. As pipe laying progresses and at the conclusion of the work, thoroughly clean all new pipelines by flushing with water or other means to remove all dirt, stones, pieces of wood or other material which may have entered during the construction period. If, after this cleaning, obstructions remain, they shall be removed prior to approval and acceptance of the pipe by PWD.
- B. All pipes shall be video inspected by PWD prior to any pavement and restoration finishes. Any pipe found to be defective (crushed, open joints, blocked or compromised in any way) shall be removed and replaced as directed by PWD at no additional cost to the City. The Contractor shall be responsible for communication with PWD in advance to schedule video inspections; delays in construction incurred by awaiting inspection shall not be compensable delays.
  - 1. If the initial inspection request results in a failed inspection, a post-construction reinspection cost will be assessed for rescheduled inspection work orders that also result in a failed inspection. This cost will be assessed for all subsequent inspection work orders thereafter. Cost will be calculated based on the time spent by inspectors and whether the time was regular or overtime:

- a. Half day (up to four hours) regular: \$692.12
- b. Half day (up to four hours) overtime: \$953.51
- c. Full day (four to eight hours) regular: \$1384.24
- d. Full day (four to eight hours) overtime: \$1907.02

### 3.03 SPARE PARTS

- A. Contractor shall provide one (1) spare permanent domed riser protection sediment filter bag for the permanent domed riser protection, per installed inlet filter location. For tracking and delivery purposes, quantities of each spare part item are documented in Appendix H. Spare parts shall be delivered to PWD GSI Maintenance Garage at the address below. No additional payment will be made for the provision, installation, or delivery of permanent domed riser protection.

Attn:  
Edward Force  
Cell: 267-909-0151  
PWD Collectors System Yard  
Fox Street and Abbottsford Avenue  
Philadelphia, PA 19129

END OF SECTION

SECTION 02709  
SUBSURFACE STORMWATER STORAGE

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. In general, the work to be done under this section consists of construction activities pertaining to subsurface stormwater storage, including but not limited to earthwork and excavation, protection of existing features, preparation of subgrade, check dam construction, grading, sheeting and shoring, placement and compaction of clean stone, construction of infiltration columns, construction of stone and/or modular stormwater storage structures, sealing and waterproofing of intersecting structures and utilities, backfilling, and any incidental and related operations.

1.02 RELATED WORK

- A. Section 02135 Erosion and Sedimentation Control
- B. Section 02161 Sheeting and Shoring
- C. Section 02210 Earthwork
- D. Section 02370 Geosynthetics
- E. Section 02700 Sewerage and Drainage
- F. Section 02707 Thermoplastic Drainage Pipe and Fittings
- G. Section 02720 Stormwater Surface Features
- H. Section 02732 Soil Properties Investigation
- I. Section 02736 Observation Wells

1.03 REFERENCE STANDARDS

- A. ASTM International
  1. ASTM C117 - Standard Test Method for Materials Finer than 75- $\mu$ m (No. 200) Sieve in Mineral Aggregates by Washing
  2. ASTM C535- Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
  3. ASTM C131 - Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
  4. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
  5. ASTM F2418 - Standard Specification for Polypropylene (PP) Corrugated Wall Stormwater Collection Chambers
  6. ASTM F2787 - Standard Practice for Structural Design of Thermoplastic Corrugated Wall Stormwater Collection Chambers
  7. ASTM A536 - Standard Specification for Ductile Iron Castings

8. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
9. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
10. ASTM D4253 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table

B. American Association of State Highway and Transportation Officials (AASHTO)

1. AASHTO M-43 - Standard Specification for Sizes of Aggregate for Road and Bridge Construction

C. Other Agencies

1. PennDOT Publication 408 - Specifications
2. Pennsylvania Test Methods (PTM), current published standards.
3. American Public Works Association (APWA) - Uniform Color Code.

#### 1.04 SUBMITTALS

- A. Submit a list of materials to be provided for work under this Section including the name and address of the materials producer and the location from which the materials are to be obtained. Include:

1. Aggregate: sieve analysis
2. Modular stormwater storage units: product manufacturer and specification sheets. If a product substitution is requested by Contractor, submittal shall include redesign of system including system storage calculations.

- B. Submit certificates, signed by the materials producer, stating that materials meet or exceed the specified requirements.

- C. Submit samples of coarse aggregates and sand.

1. Aggregate and sand: Samples of loose material in sealed bag labeled with name of material and manufacturer to be submitted for analysis by PWD. Quantity of sample by weight shall be in accordance with ASTM standards, and may be confirmed by contacting BLS directly at (215) 685-1430. Deliver the sample(s) to the loading dock entrance of the building, and call Jerome David at (215) 685-1430 upon arrival. The sample shall include the "Request for Test" form (Appendix G of the specifications)

- D. Submit unofficial results of soil investigation and double-ring infiltrometer testing upon completion. Official results shall be submitted as part of the final as-built package. See Section 02732 for soil testing requirements and Section 01300 for as-built package requirements.

#### 1.05 QUALITY ASSURANCE

- A. All materials, methods of construction, and workmanship shall conform to applicable requirements of ASTM, PTM, PennDOT Standard Specifications and AASHTO Standards, unless otherwise specified.
- B. Upon completion of relevant excavation work, and prior to placement of geotextile and aggregate, subgrade soil shall be inspected by PWD or authorized representative. Survey or

acceptable measurement by the Contractor shall verify the finished subgrade elevation in accordance with the construction plans.

- C. Upon completion of placement of subgrade storage (stone fill or as otherwise specified) and geotextile, and prior to backfilling or surface restoration, the structure shall be inspected by PWD or authorized representative. Survey or acceptable measurement by the Contractor shall verify the finished elevation(s) of the subsurface stormwater trench in accordance with the construction plans.

#### 1.06 MEASUREMENT AND PAYMENT

- A. Backfill and placement of stone or sand for subsurface stone stormwater bed shall be paid for at the lump sum prices bid for associated work. The price shall include furnishing clean washed aggregate as specified, placement and compaction of aggregate, furnishing and placing geotextile fabric, and any necessary backfill and trench protection as may be required for construction.
- B. Modular stormwater storage structures will be paid for at the lump sum prices bid for associated work. This installation shall include any observation or maintenance ports integral to the modular system, all interfaces required for piping, waterstops, geogrid and geotextile installation, utility lateral crossing conduits, onsite assembly of modular units, and furnishing and installing any additional fittings or appurtenant materials necessary to complete installation of the modular stormwater storage system.
  - 1. If product substitution requires that the footprint of system be increased to achieve the design storage volume and the footprint increase is approved by PWD, the increase in quantities, including but not limited to excavation, stone and sand backfill, and paving will not be measured for payment and will be considered incidental to the lump sum bid for the structures.
- C. Anti-seep collars will be paid for at the lump sum prices bid for associated work and shall include all materials and appurtenant work as necessary to install the collars as shown on the Drawings.
- D. Split pipe utility sleeving for protection of existing utility crossings will be paid for at the lump sum prices bid for associated work. The price bid shall include all labor and materials to fully construct a water tight seal for the utility crossing sleeving as described herein and depicted on the Drawings, including but not limited to PVC piping, seals and fittings, temporary support structures, plastic welding materials and tools, and any appurtenant materials or work necessary for a complete installation. The price bid shall encompass all sleeve diameters necessary to properly encase all utility crossings indicated to be sleeved on the Drawings. The price bid excludes the cost of anti-seep collars.
- E. Infiltration columns will be paid for at the lump sum prices bid for associated work, and shall include all materials and appurtenant work as necessary to install the columns as shown on the Drawings.
- F. Protection and waterproofing of existing manholes and other structures within the limits of the storage stone shall be included in the lump sum prices bid for associated work. The included price for protection and waterproofing of existing structures shall include all equipment, labor, and materials necessary to complete the installation of a geomembrane wrap on the exterior of all structures within the limits of the proposed storage stone. No entry of the structures is anticipated to complete this work.



1.07 DELIVERY STORAGE AND HANDLING

- A. Deliver, store, and handle all materials to ensure protection from damage.
- B. The Contractor is reminded that unprotected stockpiles of materials may be considered as degraded condition by weathering and rendered unacceptable for use by PWD. In particular, clean washed stone may become contaminated if left unprotected onsite; PWD reserves the right to require stockpile protection and/or replacement of damaged or compromised materials at no additional cost to the City.

PART 2 PRODUCTS

2.01 AGGREGATE

- A. Coarse aggregates shall meet the size and grading requirements as defined in Standard Sizes of Coarse Aggregate, Table 4, AASHTO Specifications, Part I, 19th Ed., 1998, or latest edition, unless otherwise specified.
  - 1. Maximum wash loss of 1% (ASTM C117).
  - 2. Maximum abrasion of 40% for 500 revolutions per ASTM C535 or C131 as appropriate to aggregate size.
  - 3. All aggregate shall be clean and thoroughly washed.
  - 4. Aggregate shall be 100% crushed material.
- B. Unless otherwise approved by PWD, coarse aggregate for the stormwater trenches shall be clean washed and uniformly graded as defined in Standard Sizes of Coarse Aggregate, Table 4, AASHTO Specifications, Part I, 19th Ed., 1998, or latest edition, unless otherwise specified.

1. Grading Requirements for AASHTO No 3

U.S. Standard Sieve Size	Percent Passing
2 ½" (63 mm)	100
2" (50 mm)	90-100
1 ½" (37.5 mm)	35-70
1" (25 mm)	0-15
½" (12.5 mm)	0-5

2. Grading Requirements for AASHTO No. 57

U.S. Standard Sieve Size	Percent Passing
1 ½" (37.5 mm)	100
1" (25 mm)	95-100
½" (12.5 mm)	25-60
No. 4 (4.75 mm)	0-10
No. 8 (2.36 mm)	0-5

- 3. Any and all other specified coarse aggregates shall conform in gradation and type to the current standards of PennDOT Publication 408, Section 703 Table C.

- C. Crushed concrete shall not be an acceptable substitute for coarse aggregate unless specifically authorized in writing by PWD prior to placement.

2.02 SAND

- A. Sand used to line the bottom of stormwater trenches shall be AASHTO M-43 No. 9 or 10.

1. Grading Requirements for AASHTO No 9

U.S. Standard Sieve Size	Percent Passing
3/8" (9.5 mm)	100
No. 4 (4.75 mm)	85-100
No. 8 (2.36 mm)	10-40
No. 16 (1.18 mm)	0-10
No. 50 (300 μm)	0-5

2. Grading Requirements for AASHTO No 10

U.S. Standard Sieve Size	Percent Passing
3/8" (9.5 mm)	100
No. 4 (4.75 mm)	85-100
No. 100 (150 μm)	10-30

2.03 BACKFILL MATERIALS

- A. See Section 02210 Earthwork

2.04 SPLIT PIPE UTILITY SLEEVE

- A. Utility sleeves (i.e., pass-through conduit) on new or relocated utilities shall consist of Schedule 40 PVC pipe of adequate diameter to convey the utility within unless otherwise approved by PWD.
- B. Utility sleeves on existing utilities shall be split pipe conduit, Model P6F as manufactured by Conduit Repair Systems or approved equal.
- C. Utility sleeves used for prefabricated modular storage systems shall be in accordance with the manufacturer's instructions.
- D. Split pipe utility sleeves shall be watertight and sealed at either end with non-shrink grout or sealant.

2.05 ANTI-SEEP COLLARS

- A. Anti-seep collars shall be quarter-inch (1/4") HDPE sheets cut to the dimensions indicated and installed per the Drawings. All metal fittings or attachments used shall be nylon or stainless steel (Grade 304 or better). Plastic sealant for weld shall be as suggested by manufacturer.

2.06 INFILTRATION COLUMNS

- A. Infiltration column sections shall be 12-inch (12") diameter PVC pipe, installed as depicted on the Drawings.

- B. Infiltration column configurations shall be as depicted on the Drawings.
- C. If the tops of infiltration columns are installed at the ground surface, the infiltration column section shall be solid (non-perforated) within the stormwater soil. Infiltration columns shall have perforated pipe sections within the stormwater trench (uniformly graded stone) section of the Stormwater Management Practice. The perforated pipe section shall extend below the Stormwater Management Practice a minimum of five-feet (5') into permeable soil.
- D. Perforations shall be one half-inch (0.5") diameter, drilled vertically and radially two-inches (2") apart, on center, and offset one-inch (1") every other row.
- E. Pipe sections shall be mated with soil-tight seals and fittings.
- F. Top cover of infiltration column shall be a twelve-inch (12") diameter ductile iron solid cover per ASTM A536 70-50-05. Solid cover shall be lockable.
- G. Aggregate fill within infiltration columns shall be AASHTO #57 clean washed stone, consistent with aggregate used in stormwater trench.
- H. Perforated pipe within soil section shall be wrapped in nonwoven geotextile to prevent intrusion of soil into infiltration column.

## PART 3 EXECUTION

### 3.01 EXCAVATION, SUBGRADE PREPARATION, AND GRADING

- A. See Section 02210 Earthwork.
- B. Subgrade of infiltration beds shall be level: Plus or minus one-half inch (+/- 1/2") is acceptable as level.
- C. Grading shall be performed to the lines and grades shown on the Drawings. All objectionable material encountered within the limits indicated shall be removed and disposed of by the Contractor.
- D. In excavation faces, all loose or protruding rocks shall be barred loose or otherwise removed to line or finished grade of slope. All cut and fill slopes shall be uniformly dressed to the slope, cross-section, and alignment shown on the Drawings or as directed by PWD or authorized representative.
- E. The bottom surface of any excavation for an infiltration system shall be uncompacted yet stable. The top three to six inches (3"-6") of remaining subgrade soils shall be scarified prior to installation of the system, unless otherwise directed by PWD.
- F. Prior to backfill for stone stormwater systems, Double Ring Infiltrometer Testing shall be conducted in one location for each system footprint that is not fully lined with an impermeable (HDPE) liner. Test holes shall be located within the limits of the proposed trench excavation and results of the testing shall be submitted to PWD or an authorized representative. Please see Section 02732 for additional details.

### 3.02 INSTALLATION OF SAND LAYER

- A. Sand layer, where specified in the Drawings, shall be installed across the bottom of the infiltration bed, immediately after approval of subgrade preparation (to include infiltration testing for infiltrating systems) by PWD. Sand shall be compacted in a single six-inch (6") lift, maximum, and be finished to a level surface.

### 3.03 GEOTEXTILES AND GEOMEMBRANES

- A. See Section 02370 for installation of geotextiles and geomembranes.

### 3.04 INSTALLATION OF SUBSURFACE STONE STORMWATER TRENCHES

- A. Observation wells shall be installed as indicated in the Drawings prior to placement of aggregates in the trenches. Care shall be taken to avoid compacting the bottom of the bed during the excavation necessary for observation well installation. All well covers shall be level with the finished grade upon surface restoration. Please see Section 02736.
  - 1. When installed within a stormwater basin, such as a rain garden or stormwater bumpout, the PVC cap used in lieu of the well cover shall extend three inches above the maximum ponding depth, as indicated on Drawings. Contractor is strongly encouraged to cut final height of PVC after surface features have been installed at the designed elevations.
- B. Install coarse aggregate in eight inch (8") maximum lifts. Lightly compact each layer with equipment, keeping equipment movement on storage bed subgrades to a minimum. Minimum compaction should be made with a standard walk-behind vibratory compactor; larger equipment may be approved on a case-by-case basis by PWD. Hand compaction and settlement shall not be considered sufficient.
- C. Continue placing and compacting aggregate lifts to the full depth indicated on the Drawings. Once aggregate is backfilled and compacted to grades indicated on the Drawings (and elevations verified for the as-built drawings), geotextile shall be folded over and overlapped on top of the bed to prevent soil intrusion into the aggregate bed.
- D. Install detectable underground utility warning tape at the perimeter on all sides of the subsurface stone storage trench.
- E. Clean washed stone shall be protected from sedimentation at all times. Any stone left exposed (unprotected) during a rainfall event or at the end of any workday shall be considered compromised, and may be required (at the sole discretion of PWD) to be removed and replaced with new material at no additional cost to the City.

### 3.05 INSTALLATION OF TREE PITS

- A. All sheeting and shoring employed in construction must be removed.
- B. Soil shall be placed over approved areas to a depth sufficiently greater than required, so that after compaction, the complete work will conform to the lines, grades and elevations indicated (including mulch). Structural soil shall be compacted to the manufacturer's specifications. Planting soil shall be placed in twelve inch (12") lifts. Lightly compact each lift of soil to prevent settlement and consolidate soils. Compaction shall be approximately eighty to eighty-five percent (80-85%) standard Proctor Density (as determined by ASTM D698 or ASTM D1557). Approved compaction equipment includes a smooth-drum roller or plate compactor, and vibratory compactors are prohibited. Typically, one to three (1-3) passes per lift will achieve sufficient compaction; PWD reserves the right to require compaction testing on any placed materials.
- C. Once placed, eliminate traffic of all vehicles and/or heavy equipment in the areas that will be prepared for planting operations.

### 3.06 INSTALLATION OF SPLIT PIPE UTILITY SLEEVES

- A. Where an existing utility lateral or branch main intersects the stone stormwater storage system, a pass-through conduit (split pipe utility sleeve) shall be constructed to convey the existing utility where possible.
- B. The Contractor shall coordinate sleeving of all existing and intersecting utility lines with the owners/operators of said utility lines.
- C. PWD shall review and approve any pass-through conduits for utility lines not indicated on the Drawings in advance and any utility laterals that may be reconstructed such that a pass-through conduit is not necessary shall be so reconstructed. If, in the determination of PWD, a pass-through conduit is insufficient, a trench ‘break’ may be constructed at the direction of PWD, consisting of standard backfill to protect the existing utility. Any pass-through conduits for utilities not indicated on the Drawings found to be necessary upon excavation will be paid at a contingency price.
- D. Pass-through conduits shall be constructed of an adequate diameter to convey the utility lateral within.
- E. Anti-seep collars shall be installed at either end of the pass-through conduit, outside the geotextile wrap of the stone stormwater storage.
- F. The conduit shall be of watertight construction, and shall be sealed at either end around the existing pipe with non-shrink grout or sealant. PWD shall be allowed to inspect the watertight seal to determine its integrity. If deemed inadequate, the Contractor shall make any and all effort needed to ensure compliance with this requirement. Any standpipe, valve, or other vertical feature of the crossing utility shall be sufficiently isolated from the stormwater storage and remain accessible. This may be accomplished by creating a standpipe sleeve, or by excluding a small separation area around the vertical feature from the stormwater storage trench stone.

### 3.07 INSTALLATION OF ANTI-SEEP COLLARS

- A. Anti-seep collars shall be employed as indicated on the Drawings. Anti-seep collars are typically used to prevent water from flowing along a pipe trench and impacting existing utilities.
  - B. Anti-seep collars shall be installed on pipes leading from stormwater storage areas to surrounding substances as depicted on the Drawings, or as directed by PWD. Geotextile liners, if in place at the anti-seep collar location, shall be minimally cut to allow for the pass-through section and then sealed within the joint between the solid external sheets of the anti-seep collar. All fittings and seals shall be installed to manufacturer’s specifications for a watertight seal.
1. contingency price.

### 3.08 INSTALLATION OF PIPING

- A. See Section 02707 Thermoplastic Drainage Pipe and Fittings for requirements for thermoplastic pipe installation, inspection, and cleaning.

### 3.09 INSTALLATION OF INFILTRATION COLUMNS

- A. Infiltration columns shall be placed in locations shown on the Drawings.
- B. A temporary 14-inch (14”) diameter casing shall be augured a minimum distance of five-feet (5’) into a permeable soil layer. The permeable soil layer shall be identified by an on-site Engineer or Geologist appointed by Philadelphia Water and the Engineer of Record, or their designee.

- C. To minimize soil compaction by construction equipment, auguring shall be performed from outside the Stormwater Management Practice if possible. If it is not possible to augur from outside the Stormwater Management Practice, one of two other options may be used: (1) Augur the infiltration column into place prior to excavating the Stormwater Management Practice; or (2) Augur the infiltration column into place from within the Stormwater Management Practice using equipment having a maximum tire pressure of four pounds per square inch (4 psi).
  - D. The perforated PVC pipe shall be lowered into the prepared borehole. Nonwoven geotextile shall be securely affixed to the perforated sections that will be installed in soil sections within or below the Stormwater Management Practice.
  - E. Infiltration columns shall be installed vertically plumb (as verified by use of a hand level). The Contractor shall make every effort necessary to maintain this plumb condition until backfilling is complete. Wells found to be out of plumb shall be unacceptable and replaced at no additional cost to the City.
  - F. Remove temporary casing and backfill around the infiltration columns with soil or stone, according to section, as specified on the Drawings.
  - G. Fill infiltration columns with uniformly graded stone.
  - H. If installed at the ground surface, infiltration columns shall have a concrete ring for support. The concrete ring shall be a minimum of six-inches (6") wide around the cover frame, six-inches (6") thick, and poured upon a minimum of six-inches (6") of lightly compacted AASHTO #57 stone bedding.
- 3.10 BACKFILL
- A. Follow requirements of Section 02210 Earthwork.

END OF SECTION

SECTION 02720  
STORMWATER SURFACE FEATURES

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. In general, the work to be done under this section consists of construction activities pertaining to stormwater surface features, such as rain gardens, bumpouts, tree pits, and planter boxes. This work may include earthwork and excavation, protection of existing features, preparation of subgrade, concrete and earthen check dam construction, grading, sheeting and shoring, construction of stormwater storage structures, installation of energy dissipaters, backfilling, and any incidental and related operations.

1.02 RELATED WORK

- A. Section 02135 Erosion and Sedimentation Control
- B. Section 02210 Earthwork
- C. Section 02370 Geosynthetics
- D. Section 02500 Paving and Surfacing
- E. Section 02508 Landscape Pavers
- F. Section 02700 Sewerage and Drainage
- G. Section 02707 Thermoplastic Drainage Pipe and Fittings
- H. Section 02709 Subsurface Stormwater Storage
- I. Section 02830 Green Stormwater Infrastructure Soils
- J. Section 02900 Landscaping
- K. Section 02925 Landscape Fencing

1.03 REFERENCE STANDARDS

- A. ASTM International
  - 1. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
  - 2. ASTM C979 – Standard Specification for Pigments for Integrally Colored Concrete
  - 3. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete
  - 4. ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
  - 5. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
  - 6. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
- B. American Association of State Highway and Transportation Officials (AASHTO)

1. AASHTO M 194 - Standard Specification for Chemical Admixtures for Concrete

C. Other Agencies

1. PennDOT Publication 408 - Specifications.
2. Pennsylvania Test Methods (PTM), current published standards.
3. National Resources Conservation Service (NRCS) of the USDA - Soil Survey Manual and/or Soil Survey Laboratory Methods Manual, current editions.
4. Test Methods for the Examination of Composting and Compost (TMECC), U.S. Composting Council / U.S. Department of Agriculture, current edition.
5. Association of Official Analytical Chemists (AOAC), Official Methods of Analysis, current edition.

1.04 SUBMITTALS

- A. Submit a list of materials to be provided for work under this Section including the name and address of the materials producer and the location from which the materials are to be obtained. Include:
  1. Aggregate: sieve analysis
  2. Drain basin and pipe: product manufacturer, specification sheets, and perforation schedule
- B. Submit certificates, signed by the materials producer, stating that materials meet or exceed the specified requirements.
- C. Submit samples
  1. Aggregate: Samples of loose material in sealed bag labeled with name of material and manufacturer to be submitted for analysis by PWD. Quantity of sample by weight shall be in accordance with ASTM standards, and may be confirmed by contacting BLS directly at (215) 685-1430. Deliver the sample(s) to the loading dock entrance of the building, and call Jerome David at (215) 685-1430 upon arrival. The sample shall include the "Request for Test" form (Appendix G of the specifications)
  2. Samples of any block or stone to be incorporated into the structures shall be approved by PWD (except existing on-site stone to be reused). Samples may be delivered to the worksite or PWD Construction field office at the discretion of PWD.

1.05 QUALITY ASSURANCE

- A. All materials, methods of construction, and workmanship shall conform to applicable requirements of ASTM, PTM, PennDOT Standard Specifications and AASHTO Standards, unless otherwise specified.
- B. Upon completion of relevant excavation work, and prior to placement of any materials under this section, subgrade shall be inspected by PWD or authorized representative. Survey or acceptable measurement by the Contractor shall verify the finished subgrade elevation in accordance with the construction plans.
- C. Soil Testing Laboratory Qualifications (if necessary): The laboratory shall be an independent laboratory, recognized by the State Department of Agriculture, preferably a university or cooperative extension laboratory. The testing laboratory must have experience in performing agronomic testing including physical and chemical properties of soil. Tests shall be made in



strict compliance with the standards of the Association of Official Analytical Chemists and follow standards from the NRCS Soils Manual and ASTM testing methods applicable to the specific tests requested. Laboratory shall have staff fully qualified to review test results, and to make recommendations to amend samples based on what is planned to grow in the soil. American Association for Laboratory Accreditation (A2LA) certification is preferred.

- D. Upon completion of placement of surface stormwater features, and prior to backfilling or surface restoration, the structure shall be inspected by PWD or authorized representative. Survey or acceptable measurement by the Contractor shall verify the finished elevation(s) of all features in accordance with the construction plans.

#### 1.06 MEASUREMENT AND PAYMENT

- A. Standalone stormwater trees will be paid for at the lump sum prices bid for associated work. The price bid shall include any necessary sheeting and shoring, furnishing, geotextiles, furnishing and placement of any backfill required due to over excavation, and any other appurtenant work as required.
- B. Energy dissipaters, rip rap, splash pads, spillways, flared end sections and endwalls shall be paid for at the lump sum prices bid for associated work. The price bid shall include all work necessary to construct features and may include excavation for foundation, subgrade preparation, delivery, storage and installation of all materials such as stone subbase, concrete or cast-in-place units, reinforcing steel, geotextiles, stone or masonry units for use in splash pad, and any appurtenant work as may be required to construct a functional energy dissipater as seen on Drawings.

### PART 2 PRODUCTS

#### 2.01 CONCRETE FOR PLANTER BOXES, CONCRETE SURROUNDS AND NON-STANDARD CURBING

- A. All concrete to be used for precast or cast-in-place surrounds, planter boxes, and non-standard curbing shall have a minimum specified compressive strength of 3500 pounds per square inch (psi) per ACI 318 / ASTM C39 unless otherwise specified. All concrete shall conform to PWD's Standard Specifications for Masonry Concrete.
- B. All exposed concrete surfaces shall be finished to a smooth face. Air pockets, exposed lifting points, cracks, or other visible damage shall not be acceptable. All finished edges and corners shall be chamfered or rounded, typically three-quarters of an inch ( $\frac{3}{4}$ " ) or as specified on the Drawings.
- C. Curbing for stormwater bumpouts shall comply with the requirements in Section 02500 and shall be secure and unmovable without the use of mechanized power equipment.
- D. Coloring agents, stains, or paints to be utilized shall be as specified in color and composition. Any additives to be included prior to placement shall be verified by the concrete mix designer as not compromising the specified strength. All concrete indicated as 'colored' on the Drawings shall be designed and installed with integrally-colored concrete.
  - 1. Integrally-colored concrete shall contain L.M. Scofield Company Colored CHROMIX P Admixture or approved equal. Color shall be as noted on the Drawings.
  - 2. Admixtures shall be colored, water-reducing, admixture containing no calcium chloride with coloring agents that are lime-proof and ultraviolet resistant.

3. Admixture shall conform to the requirements of ACI 303, ASTM C979, ASTM C494 and AASHTO M 194.
4. Integrally colored concrete shall use curing compounds that comply with ASTM C309 and are manufactured by the same manufacturer as the admixture for consistency. On exterior surfaces use LITHOCHROME COLORWAX by L.M. SCOFIELD to cure flatwork and Cureseal sealing compound to provide curing and sealing, or approved equals.

## 2.02 BACKFILL MATERIALS

- A. Ordinary Backfill Material may include all material excavated from the trench and free of objectionable matter, unless rejected by PWD or authorized representative. The Contractor shall furnish any deficiency of Ordinary Backfill Material.
- B. Select Backfill Material shall be furnished where specified in accordance with PennDOT Publication 408 Specifications, Section 703.3, Select Granular Material-2RC (as amended). The use of slag as Select Backfill Material is hereby prohibited.
- C. Backfill placed above any subsurface stormwater trench shall be PennDOT 2A coarse aggregate stone unless otherwise specified on Drawings. Furnish Select Backfill Material in accordance with the most recent revision or amendment to PennDOT Publication 408 Specification, Section 703.2, Coarse Aggregate - 2A.

## 2.03 ENERGY DISSIPATERS

- A. Energy dissipaters shall be constructed as depicted on the Drawings. Any variation from the Drawings shall be approved by PWD prior to construction via an official submission of supplementary drawings with dimensions and materials listed.
- B. Stone for energy dissipaters shall be as described on the Drawings in size, color, material, and cut. Samples of any stone to be utilized shall be approved by PWD.
- C. All concrete to be used for concrete splash pads or energy dissipaters shall have a minimum specified compressive strength of 3500 pounds per square inch (psi) per ACI 318 / ASTM C39 unless otherwise specified. All concrete shall conform to PWD's Standard Specifications for Masonry Concrete.
- D. All exposed concrete surfaces shall be finished to a smooth face. Air pockets, exposed lifting points, cracks, or other visible damage shall not be acceptable. All finished edges and corners shall be chamfered or rounded, typically three-quarters of an inch ( $\frac{3}{4}$ " ) or as specified on the Drawings.

## PART 3 EXECUTION

### 3.01 EXCAVATION, SUBGRADE PREPARATION, AND GRADING

- A. See Section 02210 Earthwork
- B. Subgrade of infiltration beds shall be level: Plus or minus one-half inch ( $\pm \frac{1}{2}$ " ) is acceptable as level.
- C. Grading shall be performed to the lines and grades shown on the Drawings. All objectionable material encountered within the limits indicated shall be removed and disposed of by the Contractor.
- D. In excavation faces, all loose or protruding rocks shall be barred loose or otherwise removed to line or finished grade of slope. All cut and fill slopes shall be uniformly dressed to the slope,

cross-section, and alignment shown on the Drawings or as directed by PWD or authorized representative.

- E. In locations where subsurface stone storage underlies the stormwater surface feature, all work to prepare the stone storage layer shall be completed prior to installation of surface features (see Section 02709). Subsurface stone storage shall be approved by PWD prior to installation of surface structures. Appropriate stone foundation shall be utilized in all locations for precast and cast-in-place concrete surrounds, concrete check dams and curbing (stone storage may be considered as foundation if compacted stone extends completely under the concrete surrounds).
- F. In locations where the system is not underlain by subsurface stone storage or other feature, double-ring infiltrometer tests shall be performed on the prepared subgrade of the surface feature. Double ring infiltrometer testing shall be conducted in one location for each system footprint that is not fully lined with an impermeable (HDPE) liner, or as specified herein. Tests shall be located within the limits of the proposed surface feature, and results of the testing shall be submitted to PWD or an authorized representative. Please see Section 02732 for additional details.

### 3.02 BACKFILL

- A. Backfill other than planting soil or aggregate as described elsewhere in the Specifications (such as ordinary or select backfill used to fill over excavation outside installed structures) shall be brought up evenly on all sides in eight inch (8") lifts. Each layer of backfill material shall be compacted by rolling, tamping, or vibrating with mechanical compacting equipment or hand tamping to ninety-five percent (95%) compaction. If rolling is employed, it shall be by use of a suitable roller or tractor, being careful to compact the fill throughout the full width of the trench. Use a pad foot roller for cohesive fill (silts and clay) and a smooth drum roller or vibrating plate for coarse grained fill (sands and gravels). If material is compacted by hand-tamping, there must be at least one laborer tamping for each laborer shoveling material into the trench. All backfilling operation shall be in accordance with the Standard Specifications for Excavation, Refilling, Grading, Landscaping and Repaving.

### 3.03 GEOTEXTILES AND GEOMEMBRANES

- A. See Section 02370 for installation of geotextiles and geomembranes.

### 3.04 INSTALLATION OF PLANTER BOXES AND RAIN GARDENS

- A. All concrete structures shall be placed on stone bedding for stability. In the case where a concrete structure is atop a subsurface stone storage area, this may be considered adequate bedding. In all other cases, concrete structures shall be placed on a minimum four-inch (4") thick layer of PennDOT 2A stone, to extend a minimum of four inches (4") beyond the structure on all sides.
- B. All curbing and precast or cast-in-place concrete surrounds shall be installed to the dimensions and elevations indicated on the Drawings. Cast-in-place structures shall be allowed to cure prior to further operations. Connections to inlets, piping, and other associated structures shall be completed prior to backfilling operations. Detailed survey shall confirm installed structure elevations prior to additional work such as backfilling or connection to other systems.
- C. Curbing must be constructed in a manner that only allows water to enter/exit stormwater systems at designed inflow/outflow points. Apply watertight seals to gaps and expansion joints as necessary.

- D. Install all supporting and accessory structures within the stormwater surface feature, such as, but not limited to, riser structures at specified elevations, energy dissipaters, inlet covers, lay-by inlets, check dams, and wheel guards.
- E. Install all permanent protective ornamental fencing in locations as shown on the Drawings and in the manner as specified by the manufacturer. See Section 02925 Landscape Fencing for details. Care shall be taken by the Contractor not to scuff or otherwise compromise the finish of the fencing; any damaged pieces may be required by PWD to be replaced at no additional cost to the City.

### 3.05 INSTALLATION OF STORMWATER TREES

- A. Furnish, install, monitor and maintain excavation support (e.g., shoring, sheeting, bracing, trench boxes, etc.) as required by Federal, State or local laws, ordinances, regulations and safety requirements. Support the sides of excavation, to prevent any movement which could in any way reduce the width of the excavation below that necessary for proper construction and protect adjacent structures from undermining, settlement or other damage. All sheeting and shoring employed in construction must be removed.
- B. Soil shall be placed over approved areas to a depth sufficiently greater than required, so that after compaction, the complete work will conform to the lines, grades and elevations indicated (including mulch). Planting soil shall be placed in twelve inch (12”) lifts. Lightly compact each lift of soil to prevent settlement and consolidate soils. Compaction shall be approximately eighty to eighty-five percent (80-85%) standard Proctor Density (as determined by ASTM D698 or ASTM D1557). Approved compaction equipment includes a smooth-drum roller or plate compactor, and vibratory compactors are prohibited. Typically, one to three (1-3) passes per lift will achieve sufficient compaction; PWD reserves the right to require Proctor testing on any placed materials.
- C. Once placed, eliminate traffic of all vehicles and/or heavy equipment in the areas that will be prepared for planting operations.

### 3.06 FINE GRADING

- A. After soil has been spread, it shall be carefully prepared by hand scarifying or rototilling, cultivating or hand raking. All large stiff clods, lumps, brush, roots, stumps, litter and other foreign material shall be removed and disposed of in accordance with Federal, State, and local regulations. The areas shall also be free of smaller stones, in excessive quantities, as determined by PWD.
- B. Coordinate construction to limit excessive traffic over installed soils. Once placed, eliminate trafficking of all vehicles and/or equipment in the areas that will be prepared for planting operations.
- C. The Contractor shall make all efforts to not destroy soil structure by excessive traffic, working, or compacting the soil throughout the planting operation. Utilize the smallest practicable piece of low ground pressure mechanical equipment in the adjacent areas.
- D. Prepare soil before installing blankets, including any application of fertilizer, lime, organic matter, and establishment of finished grades. Add any required soil amendments and weed preventer via broadcasting, shallow tilling, or appropriate minimally-destructive method to soil.
- E. Fine-grade placed soil to slopes and elevations indicated on the Drawings. Limit finish grading to areas that can be covered with stapled erosion control blanket or mulched covering within two

days. All areas that will receive surface flows or experience ponding of water shall be covered in erosion control blanket, and no mulch shall be applied to these areas.

- F. Stapled erosion control blankets shall be installed on top of the finished grade inside each area to be covered. Each area shall receive one continuous stapled blanket. Overlaps, seams, or adjacent pieces of blankets are not acceptable, except where necessary to connect two complete rolls of blanket. Connection of dissimilar material is unacceptable. Seams shall conform to manufacturer's specifications.
- G. Along the concrete wall and/or soil edge of each structure, anchor the edge of the blanket in a six inch (6") deep trench between the face of each concrete wall (or existing material) and the planting soil. At inside corners of structures, cut each corner of the blanket to prevent overlaps when blanket is turned down into trench. Secure the blanket over the finished grade soil with a row of staples spaced approximately twelve inches (12") apart, in staggered rows, and parallel to each wall of the structure.
- H. Final soil stabilization is subject to approval by PWD. Final payment for a structure may not be made without PWD's acceptance of the final surface.

END OF SECTION

SECTION 02736  
OBSERVATION WELLS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The work of this section consists of construction of observation wells to observe and record subsurface hydrology. This may include observation wells, peak gauges, and/or other monitoring methods. Construction may include excavation, PVC or HDPE piping, metal covers, stone fill, geotextile, and any and all incidental work required for the completion of the observation wells as shown on the Drawings.

1.02 RELATED WORK

- A. Section 02370 Geosynthetics
- B. Section 02709 Subsurface Stormwater Storage
- C. Section 02720 Stormwater Surface Features

1.03 REFERENCE STANDARDS

- A. ASTM International
  - 1. ASTM A48 – Standard Specification for Gray Iron Castings.
  - 2. ASTM A536 – Standard Specification for Ductile Iron Castings

1.04 SUBMITTALS

- A. Submit a list of materials to be provided for work under this Section including the name and address of the materials producer and the location from which the materials are to be obtained.

1.05 MEASUREMENT AND PAYMENT

- A. Observation wells will be paid for as part of the lump sum prices bid for associated work. The price shall include all materials and appurtenant work necessary to fully construct wells, including but not limited to hand digging sump for observation well below bottom of excavation, auger excavation of wellholes outside of stormwater structures, furnishing and placing geotextile, furnishing and placing solid and slotted sections of PVC and HDPE well, backfill of sump with aggregate indicated in Drawings, and furnishing and placing well frames and covers.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Observation wells
  - 1. Observation wells shall be four-inch (4”) inside diameter rigid Schedule 40 PVC pipe in upper section, with solid cap.
  - 2. Slotted sections shall be four-inch (4”) PVC slotted well with 0.01 slots and attached plug, Atlantic Screen and Manufacturing item # OES40400 or approved equivalent.
  - 3. Covers for observation wells shall be lockable ductile iron with gray iron frames, East Jordan Ironworks product #00157026 or approved equivalent. Cover and/or frame shall be stamped “MONITORING WELL”. Bolts shall be machine head stainless steel with hex key insert as

appropriate. Bolts shall be installed clean and free of grit or debris and coated using white lithium grease or equivalent metal-to-metal lubricant and rust protector prior to initial installation

4. Protective casing for observation wells in unpaved areas that experience surface ponding shall be Plastech Plus built-in aluminum mounting casing, or approved equal.
- B. Aggregate fill around observation wells shall be consistent with surrounding aggregate. In the case of a free-standing well which is not located within a given stormwater structure, the aggregate utilized shall be AASHTO #57.
- C. Non-woven geotextile (drainage filter fabric) shall conform to the requirements specified under Section 02730 – Geosynthetics.

## PART 3 EXECUTION

### 3.01 OBSERVATION WELLS

- A. Observation wells are typically placed within a subsurface stormwater structure. The well shall be placed in a location in accordance with the Drawings. Relocation of a well shall require advance approval by PWD.
- B. The well location shall be over-excavated twelve inches (12”) below the depth of the surrounding subsurface stormwater trench. This excavation shall be performed by hand, so as not to disturb the surrounding soils. Observation wells to be installed in geomembrane-lined systems shall be emplaced flush with the bottom of the trench and not over-excavated.
- C. The slotted section of well shall be placed into the over-excavation, with the attached plug at the bottom. A minimum of six inches (6”) separation shall be maintained between the top of the slotted well section and the top of the subsurface stormwater structure. Well section length shall be field-adjusted to maintain this separation.
- D. All well sections shall be installed vertically plumb (as verified by use of a hand level). The Contractor shall make every effort necessary to maintain this plumb condition until backfilling is complete. Wells found to be out of plumb shall be unacceptable and replaced at no additional cost to the City.
- E. The over-excavation and area surrounding the well within the subsurface stormwater structure shall be backfilled with the same material as the stormwater structure (typically AASHTO #57 stone).
- F. The well section from the slotted section ending six inches (6”) below the top of the stormwater structure to the top of the well within the cover shall be four-inch (4”) solid Schedule 40 PVC, attached to the slotted section by a PVC coupling.
- G. The area surrounding the solid well section shall be restored in kind with the adjoining area over the subsurface stormwater structure. Any geotextile wrap separating the stormwater structure from the covering fill shall be cut and wrapped six inches (6”) up the solid well section.
- H. The well cover shall be installed within the surface restoration as required, such that the cover plate is flush with the surrounding surface. Observation wells placed in unpaved areas located within green stormwater infrastructure that will experience surface ponding of water shall extend three (3) inches above the maximum ponding depth.
- I. The well cover shall be stamped with a unique identification number, to be provided by PWD. A hexagonal key locking bolt should be used for the cover. Bolts shall be free of grit and debris

and a lubricant listed in Products section above shall be used to coat the entire thread and thread hole prior to initial installation.

- J. If the well cover is not installed into a concrete surface, it shall have a concrete ring or frame poured for support. This concrete ring shall be a minimum of six inches (6") wider in any dimension than the cover frame, of equal depth as the cover frame itself, and poured upon a minimum of six inches (6") of AASHTO #57 stone bedding. A frame conforming to these minimum dimensions may be circular or square. For locations in permeable pavement, frames and covers shall be located within the permeable pavement area surrounded by edge curb.
- K. Observation wells that are not flush with the surrounding surface shall have a protective casing set into the concrete ring. The inner diameter of the protection casing shall be at least one inch (1") greater than the outer diameter of the PVC well screen.
- L. The solid well section shall extend into the cover frame enough such that a bentonite seal can be placed around the well within the frame, and a solid slip-on cap can be fitted onto the pipe end.
- M. The contractor shall demonstrate to the PWD inspector that the cap is removable.

END OF SECTION



## SECTION 02830

### GREEN STORMWATER INFRASTRUCTURE SOILS

#### PART 1 GENERAL

##### 1.01 SCOPE OF WORK

- A. The scope of work includes all labor, materials, tools, supplies, equipment, facilities, transportation and services necessary for, and incidental to performing all operations in connection with furnishing, delivery, and installation of Planting and Stormwater Soils related to green stormwater infrastructure. Scope of work includes, but is not limited to, sourcing, purchase, delivery and installation of Planting and Stormwater Soil and soil amendments, clean up and disposal of all excess and surplus material, and placement of erosion control blanket and weed barrier geotextile over all soil surfaces that are not stabilized through planting.
- B. The specific soil types in this section include:
  - 1. Planting Soil
  - 2. Stormwater Soil

##### 1.02 RELATED SECTIONS

- A. Section 01535 Construction Tree Protection
- B. Section 02135 Erosion and Sediment Control
- C. Section 02210 Earthwork
- D. Section 02370 Geosynthetics
- E. Section 02732 Soils Properties Investigation
- F. Section 02709 Subsurface Stormwater Storage
- G. Section 02720 Stormwater Surface Features
- H. Section 02900 Planting
- I. Section 02920 Turf and Grasses

##### 1.03 REFERENCE STANDARDS

- A. In the event that the requirements of any of the referenced standards and specifications herein conflict with each other the more stringent requirement shall prevail. Where reference is made to one of the standards, the revision in effect at the time of bid opening shall apply.
- B. ASTM International
  - 1. ASTM C33 – Gradation Requirements for Coarse Aggregates.
  - 2. ASTM C602 - Standard Specification for Agricultural Liming Materials.
  - 3. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
  - 4. ASTM D3385 – Standard Test Method for Infiltration Rate of Soils in Field Using Double-Ring Infiltrometer.
  - 5. ASTM D4972 – Standard Test Method for pH of Soils.

6. ASTM D5298 – Standard Specification for Topsoil Used for Landscaping Purposes.
7. ASTM D6913 – Standard Test Methods for Particle Size Distribution (Gradation) of Soils Using Sieve Analysis.
8. ASTM7928 – Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis.
9. ASTM D7481 – Standard Test Methods for Determining Loose and Tapped Bulk Densities of Powders using a Graduated Cylinder.
10. ASTM F1632 – Standard Test Method for Particle Size Analysis and Sand Shape Grading of Golf Course Putting Green and Sports Field Rootzone Mixes.
11. ASTM F1647 – Standard Test Methods for Organic Matter Content of Athletic Field Rootzone Mixes.
12. ASTM F1815 – Standard Test Methods for Saturated Hydraulic Conductivity, Water Retention, Porosity, and Bulk Density of Athletic Field Rootzones.

C. Other Standards:

1. U.S. Department of Agriculture (USDA), Natural Resources Conservation Service, Soil Texture Calculator.
2. USDA, Natural Resources Conservation Service, 2003. National Soil Survey Handbook, title 430-VI, current edition.
3. USDA Soil Survey Laboratory Methods Manual, Soil Survey Investigations Report, current edition.
4. Environmental Protection Agency (EPA) Section 503 Regulations.
5. Department of Environmental Protection (DEP), Pennsylvania Bulletin, Management of Fill, Clean Fill Policy, current edition.
6. U.S. Composting Council (USCC), Test Methods for the Examination of Composting and Compost (TMECC), current edition.
7. USCC, Landscape Architecture / *Design Specifications for Compost Use, Planting Bed Establishment with Compost.*
8. Association of Official Analytical Chemists (AOAC), Official Methods of Analysis, current edition.
9. Soil Science Society of America (SSSA), *Methods of Soil Analysis*, current edition.
10. Modified Philip Dunne (MPD) Infiltrometer method for measurement of the saturated hydraulic conductivity of surface soil.
11. Philadelphia Parks and Recreation Contractor Guidelines.

1.04 DEFINITIONS

- A. Amendment: product added topsoil to improve soil's physical qualities. Amendments are classified as general soil amendments, fertilizers, biological, and pH amendments.
- B. Bulk Density: an indicator of soil compaction calculated as the dry weight of soil by its volume typically expressed in g/cm<sup>3</sup>.

- C. Coarse Sand: sharp natural or manufactured fine aggregate and further defined in this specification.
- D. Compacted soil: soil where the density of the soil is greater than the threshold for root limiting, and further defined in this specification.
- E. Compost: Well-decomposed stable organic material as defined by the US Composting Council.
- F. Debris: Elements including, but not limited to, concrete, concrete masonry, wood, excavated rock and rock fragments, rubble, overburden soils, abandoned utility structures, trash, refuse and litter.
- G. Drainage: The process of water moving through the soil, transitioning the soil from dry to saturated to field capacity, the rate of which may be expressed as the saturated hydraulic conductivity rate (Ksat; units are inches per hour).
- H. Existing Soil: Mineral soil existing at the locations of proposed planting after the majority of the construction within and around the planting site is completed and just prior to the start of work to prepare the planting area for soil modification and/or planting, and further defined in this specification.
- I. Fertilizer: amendment used for the purpose of adjusting soil nutrient composition and balance.
- J. Fine grading: The final grading of the soil to achieve exact contours and positive drainage, often accomplished by hand rakes or drag rakes or other suitable devices, and further defined in this specification.
- K. Finished grade: surface or elevation of Soil after final grading and 12 months of settlement of the soil, and further defined in this specification.
- L. Planting Soil: Soil product noted on Drawings. Generally applied to systems where stormwater runoff is not directed to pass through the soil profile for system function.
- M. Salvaged Topsoil: Stripped native loam removed within the limits of work, but outside of the “Tree Protection Areas”, to its entire natural depth.
- N. Scarify: Loosening and roughening the surface of soil and sub soil prior to adding additional soil on top, and further defined in this specification.
- O. Soil Horizons: as defined in the USDA National Soil Survey Handbook ([http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2\\_054242](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242))
- P. Soil Tilling: Loosening the surface of the soil to the depths specified with a rotary tine tilling machine, roto tiller, (or spade tiller), and further defined in this specification.
- Q. Stormwater Soil: Soil product noted on Drawings. Generally applied to systems where stormwater runoff is directed to pass through the soil profile for system function.
- R. Subgrade: Surface or elevation of subsoil remaining after completing excavation or backfill immediately beneath Planting Soil or Stormwater Soil.
- S. Topsoil: Topsoil shall be harvested from fields or development sites and shall be loose, friable mineral particles resulting from natural soil formation from the A, E and upper B horizons, or “solum” where most plant roots grow and as defined further herein.

#### 1.05 MEASUREMENT AND PAYMENT

- A. All soils used for the construction of Green Stormwater Infrastructure (GSI) will be paid as part of the lump sum prices bid for associated work. The price bid shall include the following and all appurtenant work and materials: compacting; preparing subgrade; forming berms, side slopes, ditches, removal and disposal of spoils and debris; removal, temporary storage and disposal of salvaged material; keeping site clean and free of trash and debris; complying with soil erosion and sedimentation control requirements; preservation of all vegetation and objects to remain from injury or defacement; preparation of foundation for embankment; scarifying existing soil; compaction and percolation testing. The Contractor shall anticipate compaction for the soil volume needed for construction. The soil volume shall be approved by PWD.
- B. No additional payment will be made for transportation and other costs associated with offsite disposal of excess materials, should this be necessary. This offsite disposal cost is considered incidental to the work.
- C. No additional payment will be made for the purchase, delivery, placement, and finish grading of topsoil, amendment of existing soils to meet specified requirements, or scarifying existing soils prior to placement of topsoil and finish grading.
- D. No additional payment shall be made for the as-built survey of grades and elevations. The cost to produce this as-built survey shall be included in the lump sum price bid for as-built survey and drafting.

#### 1.06 SUBMITTALS

- A. Submit a list of materials to be provided for work under this Section including the name and address of the materials producer and the location from which the materials are to be obtained.
- B. Submit dated certificates or letters, signed by the materials producer, stating that materials meet or exceed the specified requirements.
- C. Soil(s) and Compost products must be tested by an independent soil testing laboratory, such as A. McNitt & SerenSoil Testing or similar. Laboratory tests must be dated no less than one (1) month and no greater than six (6) months before delivery to the worksite.
- D. Submit a one (1) gallon sample of Stormwater Soil, Planting Soil, or Compost in a resealable plastic bag to PWD GSI Unit, Aramark Tower, 1101 Market Street, 4<sup>th</sup> Floor, Philadelphia PA 19107 with a copy of the independent soil test results included. Test reports must address each criteria listed within the Part 2 Products section herein.
  - 1. Test reports must be the same material to be supplied to the worksite. If tests fail to meet the specifications, obtain other sources of material, retest and resubmit until accepted by PWD. No soils or Compost shall be delivered to the worksite until approved by PWD.
  - 2. All Planting Soil or Compost being delivered to the worksite will have a sample collected by PWD and tested at PWD's Bureau of Laboratory Services (BLS) to confirm material matches the previously approved independent test report(s). Stormwater Soil not coming from one of the recommended suppliers listed in Part 2.06-"Suppliers" will also require a sample to be collected and tested by PWD. While some variation is expected, if the results differ significantly from the independent test report(s), then PWD has the right to reject material and suitable soil meeting the specifications herein must be installed at Contractor's expense. Soil or compost that is contaminated with debris may also be rejected upon delivery. PWD also reserves the right to sample and test material coming from one of the recommended suppliers if material does not appear to meet previously approved independent reports.

- E. Submit certificates and delivery tickets to PWD for each delivery of soil mixes. The soil supplier company name, date, and soil mix name, and quantity must be indicated on delivery tickets for all soil mix deliveries and the supplier must match the approved submittals.
- F. Submit final soil moisture and compaction testing reports at the completion of soil installation per Part 3.03 and 3.04 of the specifications herein.

#### 1.07 LABORATORY SOIL TESTING REQUIREMENTS

- A. The laboratory shall be an independent laboratory, recognized by the State Department of Agriculture. For soil tests, the laboratory must have experience in performing agronomic testing including all of the following: particle size analysis, sand sieve size analysis, pH, soluble salts, organic matter, hydraulic conductivity, and CEC. Tests shall be made in strict compliance with the standards of the Association of Official Analytical Chemists and follow standards from the NRCS Soils Manual and ASTM testing methods applicable to the specific tests requested. Laboratory shall have staff fully qualified to review test results, and to make recommendations to amend samples based on what is planned to grow in the soil. American Association for Laboratory Accreditation (A2LA) certification is preferred. An example laboratory is A. McNitt & SerenSoil Testing.
- B. Compost that participates in the US Composting Council's Seal of Testing Assurance (STA) Program and tested through an STA program lab, using appropriate test methods from the TMECC (Test Methods for the Examination of Compost and Composting) is preferred. Test data shall be presented on a Compost Technical Data Sheet.
- C. All soil testing will be at the expense of the Contractor.

#### 1.08 QUALITY ASSURANCE

- A. All materials, methods of construction, and workmanship shall conform to applicable requirements of ASTM, PTM, PennDOT Standard Specifications and AASHTO Standards, unless otherwise specified. Any fill or topsoil sources, disposal areas, or temporary offsite storage locations shall be subject to review and approval by PWD.

#### 1.09 DELIVERY, STORAGE AND HANDLING

- A. Preparation, amendment, and mixing of soils shall be performed at the soil supplier location.
- B. Weather: Do not mix, deliver, place or grade soils when frozen or with moisture above field capacity. Soils shall not be handled, hauled, placed, or compacted when wet or frozen. Soil shall only be handled when the moisture content is between the specified ranges in percent water by volume as defined in Part 3.03 of the specifications herein.
- C. Soil stockpiles on site and at the soil blender's yard shall not exceed ten (10) feet.
- D. Protect soil and soil stockpiles, including the stockpiles at the soil blender's yard, from wind, rain and washing that can erode soil or separate fines and coarse material, and contamination by chemicals, dust and debris that may be detrimental to plants or soil drainage. Once spread, soils shall be protected with staked erosion control blankets.
- E. All manufactured packaged products and material shall be delivered to the site in unopened containers and stored in a dry enclosed space suitable for the material and meeting all environmental regulations. Biological additives shall be protected from extreme cold and heat. All products shall be freshly manufactured and dated for the year in which the products are to be used.

- F. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
- G. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
- H. None of the soil materials shall be delivered to the site until independent lab results and other submittals listed herein are approved by PWD. However, final acceptance is contingent on delivery slips from supplier and samples sent to PWD's BLS lab for material verification at PWD's discretion. Certification submittal shall include recommended soil amendment products if proposed to modify the soils. Any approval of soils made conditional upon utilizing one or more amendments shall be understood to afford to PWD the right for further testing and refusal of materials that do not meet these Specifications.
- I. Soils shall not be stored on-site for longer than one (1) month prior to installation.

## PART 2 PRODUCTS

### 2.01 PROHIBITED ELEMENTS

- A. Soils shall not contain any traces of hydrocarbons, petroleum products, chemically prohibited substances, or any other elements considered to be toxic to any vegetation that is used. The soil shall be free of construction and trash debris, rocks, hydrocarbons, petroleum materials, herbicides, or other harmful contaminants that would impact plant growth.

### 2.02 COMPOST

- A. Compost is as defined by the "US Composting Council Landscape Architecture / Design Specifications for Compost Use, Planting Bed Establishment with Compost". Compost shall be a well decomposed, stable, weed-free organic matter source. It shall be derived from: agricultural, food, or industrial residuals; leaf litter and yard trimmings; or source-separated waste. The product shall contain no substances toxic to plants and shall be reasonably free (< 1% by dry weight) of man-made foreign matter. The compost will possess no objectionable odors and shall not resemble the raw material from which it was derived.
- B. Compost shall comply with the following parameters:
  1. pH: 6.0 - 8.0.
  2. Soluble salt content (electrical conductivity, 1 soil : 2 water): maximum 5 dS/m (mmhos/cm).
    - a. Compost derived from stabilized mushroom soil compost may possess a maximum EC of 10 dS/m (1:2), if the maturity testing is a minimum of 95% and ammonia (NH4) content is a maximum of 250 ppm.
  3. Moisture content %, wet weight basis: 30 – 60.
  4. Organic Matter Content, % dry weight basis: 30 – 65.
  5. Particle size, dry weight basis: 98% pass through 1/2 inch screen.
  6. Stability carbon dioxide evolution rate: mg CO<sub>2</sub>-C/ g OM/ day ≤ 3.
  7. Maturity, seed emergence and seedling vigor, % relative to positive control: minimum 80%.
  8. Physical contaminants (inerts), %, dry weight basis: <0.5%.

9. Chemical contaminants, mg/kg (ppm): meet or exceed US EPA Class A standard, 40CFR § 503.13, Tables 3 levels.

10. Biological contaminants select pathogens fecal coliform bacteria, or salmonella, meet or exceed US EPA Class A standard, 40 CFR § 503.32(a) level requirements.

2.03 CHEMICAL AMENDMENTS

A. Lime, ASTM C602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:

1. Class: Class T, with a minimum 99 percent passing through No. 8 sieve and a minimum 75 percent passing through No. 60 sieve.
2. Provide lime in form of dolomitic limestone.

2.04 PLANTING SOIL

A. Planting soil shall be harvested from fields or development sites or manufactured uniformly mixed individual soil components (topsoil, sand, compost) or existing mineral soil at the locations of proposed planting meeting the criteria specified herein.

B. Provide Planting Soil at the locations indicated on the Drawings complying with the following parameters. Minor variations with supporting independent test results for hydraulic conductivity, cation exchange capacity, pH, soluble salt content and organic matter may be considered for approval at PWD’s discretion:

1. Particle analysis must be per USDA classification for loam, sandy loam, sandy clay loam, or silt loam and is within the following parameters using ASTM D6913 and D7928:

Sieve Analysis	mm	Sieve No.	% Volume
Gravel	>2.0	10	≤11
Very Coarse Sand	2.0 – 1.0	18	
Coarse Sand	1.0 – 0.5	35	
Medium Sand	0.5 – 0.25	60	45-65
Fine Sand	0.25 - 0.10	140	
Very Fine Sand	0.10 - 0.07	200	
Silt	0.07 - 0.002		≤30
Clay	<0.002		≤20

2. pH (1 soil : 1 water): 6.0 - 7.2.

3. Organic matter (ASTM F1647, Method A): 3 - 7% (by dry weight).

4. Soluble salt content (electrical conductivity, 1 soil : 2 water): maximum 1.60 mmho/cm. Sodium (Na) salinity shall not exceed 700 ppm.

5. Cation Exchange Capacity (CEC): >12 meq/100g.

6. Nutrient analysis including macronutrients and micronutrients (Mehlich-3) with soil fertility interpretation and recommendations relevant to the specified plant species.

7. Compost shall not be added at more than 20% by volume.

2.05 STORMWATER SOIL

A. Stormwater Soil at the locations indicated on the Drawings complying with the following parameters. Minor variations with supporting independent test results for hydraulic conductivity, cation exchange capacity, pH, soluble salt content and organic matter may be considered for approval at PWD’s discretion:

1. Particle analysis must be per USDA classification for loamy sand within the following parameters:

Sieve Analysis	mm	Sieve No.	% Volume
Gravel	>2.0	10	
Very Coarse Sand	2.0 - 1.0	18	≥65
Coarse Sand	1.0 - 0.5	35	
Medium Sand	0.5 - 0.25	60	
Fine Sand	0.25 - 0.10	140	≤17
Very Fine Sand	0.10 - 0.07	200	
Silt	0.07 - 0.002		≤20
Clay	<0.002		5-15

2. pH (1 soil : 1 water): 6.0 - 7.2.

3. Organic matter (ASTM F1647, Method A): 3% - 7% (by dry weight).

4. Hydraulic conductivity (ASTM F1815) at 75% Proctor (ASTM D698): 2.0 - 6.0 in/hr.

5. Soluble salt content (electrical conductivity, 1 soil : 2 water): maximum 1.60 mmho/cm. Sodium (Na) salinity shall not exceed 700 ppm.

6. Cation Exchange Capacity (CEC): not less than 12 meq/100g.

7. Nutrient analysis including macronutrients and micronutrients (Mehlich-3) with soil fertility interpretation and recommendations relevant to the specified plant species.

8. Compost shall not be added at more than 30% by volume.

2.06 SUPPLIERS

A. The suppliers listed below have previously submitted independent soil lab results and received approvals for Stormwater Soil. The Contractor is not bound to purchase landscaping materials from suppliers on this list. Testing requirements are different for soils purchased from suppliers on this list. Contractors listed herein may also provide Planting Soil, however, this will require additional testing by PWD for approvals. See Part 1.06-“Submittals” for more details.

1. Earth Materials, LLC, Vineland, NJ, 609-548-0445

2. Laurel Valley Soils, Landenberg, PA, 866-587-6457

PART 3 EXECUTION

3.01 SITE EXAMINATION



- A. Prior to installation of soil or compost, examine site to confirm that existing conditions are satisfactory for the work of this section to proceed. PWD shall approve the condition of the subgrade and the previously installed subgrade preparation and the installation of subsurface drainage.
  1. Confirm that the subgrade is at the proper elevation and compacted as required.
  2. Confirm that all surface areas to be filled with Soil are free of construction debris, refuse, compressible or biodegradable materials, stones greater than 2 inches diameter, soil crusting films of silt or clay that reduces or stops drainage from the Soil into the subsoil; and/or standing water. Remove unsuitable material from the site.
  3. Confirm that no adverse drainage conditions are present.
- B. If unsatisfactory conditions are encountered, notify PWD immediately to determine corrective action before proceeding.

### 3.02 PROTECTION

- A. Identify protection zones according to Section 01535 "Construction Tree Protection."
- B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:
  1. Storage of construction materials, debris, or excavated material.
  2. Parking vehicles or equipment.
  3. Vehicle traffic.
  4. Foot traffic.
  5. Erection of sheds or structures.
  6. Impoundment of water.
  7. Excavation or other digging unless otherwise indicated.
- C. If soil or subgrade is overcompacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the soil and contamination; restore the subgrade as directed by PWD and replace contaminated soil with new soil.

### 3.03 SOIL INSTALLATION

- A. As described herein, independent testing report must be approved by PWD prior to soil installation and delivery slip must be presented a time of installation. PWD reserves the right to test the soils(s) delivered to the worksite at PWD's Bureau of Laboratory Services (BLS) to confirm material matches the previously approved independent test report(s) and physical sample submitted. If the results differ significantly from the independent test report(s), then PWD has the right to reject material and suitable soil meeting the specifications herein must be installed at contractors expense.
- B. All equipment utilized to install or grade Soils shall be wide track or balloon tire machines rated with a ground pressure of 4 psi or less. All grading and soil delivery equipment shall have buckets equipped with 6 inch long teeth to scarify any soil that becomes compacted.
- C. In areas of soil installation above existing subsoil, scarify the subgrade material prior to installing Soil.

1. Scarify the subsoil of the subgrade to a depth of 3 – 6 inches with the teeth of the back hoe or loader bucket, tiller or other suitable device.
  2. Immediately install the Stormwater Soil or Planting Soil. Protect the loosened area from traffic. DO NOT allow the loosened subgrade to become compacted.
  3. In the event that the loosened area becomes overly compacted, loosen the area again prior to installing the Stormwater Soil or Planting Soil.
- D. Install the Stormwater Soil or Planting Soil in 12 - 18 inch lifts to the required depths. Apply compacting forces to each lift as required to attain the required compaction. Scarify the top of each lift prior to adding more Stormwater Soil or Planting Soil by dragging the teeth of a loader bucket or backhoe across the soil surface to roughen the surface.
1. Approved compaction equipment includes a smooth drum roller or plate compactor. Typically, one to three passes per lift will achieve the desired compaction. Contractor to test desired compaction methodology with actual soil to be installed to confirm installation method and material properties are compatible and will achieve the specified compaction rates.
  2. Provide adequate equipment to achieve consistent and uniform compaction of the Soils. Use the smallest equipment that can reasonably perform the task of spreading and compaction. Use the same equipment and methods of compaction for the entire project area once soil, installation methodology, and compaction criteria have been coordinated and confirmed.
- E. Do not pass motorized equipment over previously installed and compacted soil except as authorized below.
1. Light weight equipment such as trenching machines or motorized wheel barrows is permitted to pass over finished soil work.
  2. If work after the installation and compaction of soil compacts the soil to levels greater than the above requirements, follow the requirements of Over Compaction Reduction herein.
- F. Phase work such that equipment to deliver or grade soil does not have to operate over previously installed Stormwater Soil or Planting Soil. Work in rows of lifts the width of the extension of the bucket on the loader. Install all lifts in one row before proceeding to the next. Work out from the furthest part of each bed from the soil delivery point to the edge of each bed area.
- G. Where travel over installed soil is unavoidable, limit paths of traffic to reduce the impact of compaction in Stormwater Soil or Planting Soil. Each time equipment passes over the installed soil it shall reverse out of the area along the same path with the teeth of the bucket dropped to scarify the soil. Comply with Over Compaction Reduction herein in the event that soil becomes over compacted. Access over finished grade soils shall be restricted. If access is required across placed soils, Contractor shall be required to rework compacted soil areas prior to fine grading to the full depth of the placed soils as directed by PWD.
- H. Maintain moisture conditions within the Soil during installation or modification to allow for satisfactory compaction.
1. Volumetric soil moisture level during installation shall be above permanent wilt point and below field capacity for each type of soil texture within the following ranges.

Soil texture	Permanent wilting point	Field capacity

Sand, Loamy sand, Sandy loam	5-8%	12-18%
Loam, Sandy clay, Sandy clay loam	14-25%	27-36%
Clay loam, Silt loam	11-22%	31-36%
Silty clay, Silty clay loam	22-27%	38-41%

1. The Contractor shall confirm the soil moisture levels with a moisture meter (Digital Soil Moisture Meter, DSMM500 by General Specialty Tools and Instruments, or approved equivalent). Suspend operations if the Soil becomes wet. Apply water if the soil is overly dry.

I. Installing Stormwater Soil or Planting Soil with soil or mulch blowers or soil slingers is not permitted.

### 3.04 SOIL COMPACTION REQUIREMENTS

A. Maintain at the site at all times a soil cone penetrometer with pressure dial and a soil moisture meter to check Stormwater Soil compaction and soil moisture.

1. Penetrometer shall be Dickey John Soil Compaction Tester, AgraTronix Soil Compaction Meter or approved equal.
2. Moisture meter shall be “general digital soil moisture meter”.

B. Perform a minimum of one compaction test every 12-inch lift of soil and every 300 square feet of soil installed. Maintain an up-to-date written report of compaction test results. Report shall include the date and time of test, the SMP number, and value reading from the penetrometer. PWD may review the written report at any time to confirm conformance with the specification. Submit final compaction and soil moisture report at the completion of soil installation.

C. The following are threshold levels of compaction as determined by each method for the subsoil surface and full profile of Stormwater Soil, testing each lift of Soil with a penetrometer. The same penetrometer and moisture meter shall be used to test installed soil throughout the work.

#### 1. Acceptable Compaction

- a. Standard Proctor Method – 65-75%.
- b. Penetration Resistance Method – about 75-250 psi.
- c. Soil below 75 psi soil becomes increasingly unstable and will settle excessively.

#### 2. Unacceptable Compaction

- a. Standard Proctor Method – Above 85%.
- b. Penetration Resistance Method – Approximately above 300 psi

3. Prior to testing the Stormwater Soil with the penetrometer check the soil moisture. Penetrometer readings are impacted by soil moisture and excessively wet or dry soils will read significantly lower or higher than soils at optimum moisture.

4. The penetrometer readings shall be within 20% plus or minus of the specified levels.

5. Where the Standard Proctor Method is utilized, the following Bulk Density levels based on 75% minimum and 85% maximum standard Proctor indicate acceptable compaction.

<u>Soil Texture</u>	<u>Bulk Density (g/cm<sup>3</sup>)</u>	
	<b>Max.</b>	<b>Min.</b>

Loamy Sand	1.80	1.65
Sandy Loam	1.65	1.45
Sandy clay loam	1.55	1.35
Loam	1.50	1.30
Silt Loam	1.45	1.25

### 3.05 OVER COMPACTION REDUCTION

- A. Any soil that becomes compacted to a density greater than the specified density shall be dug up and reinstalled. This requirement includes compaction caused by other sub-contractors after the Stormwater Soil or Planting Soil is installed and approved.

Surface roto tilling shall not be considered adequate to reduce over compaction at levels 6 inches or greater below finished grade.

### INSTALLATION OF CHEMICAL ADDITIVES

- A. Following the installation of each soil and prior to fine grading and installation of the Compost till layer, apply chemical additives as recommended by the soil test, and appropriate to the soil and specific plants to be installed.
- B. Types, application rates and methods of application shall be approved by PWD prior to any applications.

### 3.07 FINE GRADING

- A. PWD shall approve all rough grading prior to fine grading.
- B. Grade the finish surface of all planted areas to meet the grades shown on the Drawings.
- C. Utilize hand equipment, small garden tractors with rakes, or small garden tractors with buckets with teeth for fine grading to keep surface rough without further compaction. Do not use the flat bottom of a loader bucket to fine grade, as it will cause the finished grade to become overly smooth and or slightly compressed.
- D. Provide for positive drainage from all areas toward the existing inlets, drainage structures and or the edges of planting beds. Adjust grades as directed to reflect actual constructed field conditions of paving, wall and inlet elevations. Notify PWD in the event that conditions make it impossible to achieve positive drainage.
- E. Provide smooth, rounded transitions between slopes of different gradients and direction. Modify the grade so that the finish grade before adding mulch and after settlement is one or two inches below all paving surfaces or as directed by the Drawings.

### 3.08 CLEANING

- A. Protect areas adjacent to planting-soil preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.
- C. See Section 02135 Erosion and Sediment Control for requirements.

END OF SECTION

## SECTION 02900

### PLANTING WITHIN RAIN GARDENS

#### PART 1 GENERAL

##### 1.01 SCOPE OF WORK

- A. The work of this Section includes furnishing all labor, materials, equipment and incidentals required to complete all planting related landscaping work indicated on the Drawings and as specified herein, including but not necessarily limited to the following;
  - 1. Excavation for plantings.
  - 2. Furnishing and installing plant materials as shown on the Drawings, including shrubs, trees, and perennials.
  - 3. Mulch, fertilize, stake, and prune all plants and trees.
  - 4. Watering all specified plants.
  - 5. Final cleanup and all other work required to complete the job in accordance with the Drawings and Specifications.
  - 6. Preparation of as-planted sketch plans.
  - 7. Maintenance of all specified plants and beds for an 8-week maintenance period.
  - 8. Monthly planting status reporting of completed planted and maintenance activities.
  - 9. Provision of "As Planted" record drawings.
  - 10. Plant and tree warranties.

##### 1.02 RELATED SECTIONS

- A. Section 01101 Coordination with Philadelphia Water Department
- B. Section 01535 Tree Protection
- C. Section 02135 Erosion and Sedimentation Control
- D. Section 02830 Green Stormwater Infrastructure Soils
- E. Section 02920 Turf and Grasses

##### 1.03 REFERENCE STANDARDS

- A. American Association of Nurserymen (AAN)
- B. ANSI Z60.1 - American Standard for Nursery Stock, most current edition
- C. ANSI A 300 - Standard Practices for Tree, Shrub, and other Woody Plant Maintenance, most current edition and parts.
- D. Soil Science Society of America (SSSA) Methods of Soil Analysis, Parts 1, 2, 3 & 4
- E. American Society of Agronomy (ASA)
- F. Other Agencies
  - 1. ASTM International

- a. ASTM A641/A641M - Galvanized-steel wire
- b. ASTM B221 - Alloy 6063-T6, Aluminum Edging
- 2. Association of Official Agricultural Chemists (AOAC)
- 3. Woods End Research Laboratory, Solvita compost maturity index test.
- 4. International Society of Arboriculture (ISA)
- 5. PWD GSI Landscape Design Guidebook recommended plant list (Fall Update)
- 6. Philadelphia Parks and Recreation (PP&R - previously Fairmount Park Commission) Recommended Street Tree List
- 7. PP&R Contractor Guidelines.
- 8. USDA Rules and Regulations under the Federal Seed Act
- 9. Philadelphia Streets Department, Standard Construction Items.
- 10. Pennsylvania Department of Transportation, Form 408 Specifications.

G. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

#### 1.04 SUBMITTALS

- A. Submit complete product data for all materials furnished under this Section. One set of complete submittals is required per planting season. Any changes to materials require resubmittal. Unless otherwise noted below, all submittals must be received at least one (1) month prior to the start of the upcoming planting season as outlined in Section 00140.
- B. Submit qualifications of crew, equipment, and suppliers. Qualifications must conform with the requirements detailed in Section 1.06, Contractor Qualifications, below.
- C. Samples, testing and certifications of all materials shall be submitted for inspection and acceptance upon PWD's request. None of the landscaping materials shall be delivered to the site until samples and test results are approved by PWD, however such approval does not constitute final acceptance.
- D. Submit a schedule for planting at least one (1) month prior to the start of the upcoming planting season. Schedule shall conform to planting seasons as defined in these Specifications and take into account allotted days for completion of the Work in the Contract; any extensions of the time allotment to be made for accommodation of planting seasons may be made at the sole discretion of a Project Manager.
- E. Submit a proposed list of plant species with botanical and common names, variety, size, quantity, and source of plant materials in the varieties, sizes, and quantities indicated on the Drawings at least three (3) months prior to the start of the upcoming planting season. Sources of planting materials must be confirmed by the Contractor and written documentation of plant availability in accordance with the submitted planting schedule shall be provided by the supplier(s).
- F. Plant Substitutions for plants not available locally should be ordered from nurseries located out of the state. Substitutions may be permitted only after substantiated written confirmation and documentation is submitted that a specified plant is either not obtainable within a 100 mile radius or is not recommended for the location as shown on the landscaping plan. All

substitutions must be approved by the Projects Manager prior to installation. Substitutions should be drawn from the recommended plant list included in the PWD GSI Landscape Design Guidebook.

- G. The Contractor must provide to a Project Manager each of their plant supplier's shipping lists for review and approval after ordering, but prior to supplier's shipping any plant material. Only specified plant species will be accepted.
- H. The Contractor shall be required to submit status reports to PWD on a monthly basis during planting and maintenance activities. Photographic documentation as detailed in Section 01101 (Coordination with Philadelphia Water Department) shall be provided as part of each status report. A template for the Project Status Report is appended to these Specifications.
- I. Submit Monthly Project Status Reports using the template in Appendix M. Project Status Reports shall list detail all planting, maintenance activities, and upcoming site work. Photographic documentation shall be included with the Monthly Project Status Report in accordance with Section 01101 (Coordination with Philadelphia Water Department) of these Specifications. Project Status Reports shall be submitted within one (1) week of the end of each month.
- J. Sketch plans, photographs, and written documentation of all plant installations, including initial planting and any plant replacements during the eight (8)-week maintenance period shall be submitted monthly with Project Status Reports.
  - 1. Sketch plans must include a revised schedule with species (botanical name) and cultivars and final quantities along with a revised planting plan.
  - 2. Landscape sketch plans may be a markup of the original landscaping plan. Changes to the original landscaping plan shall be clearly noted and shown in red.
  - 3. All sketches shall be labeled "As Planted", dated, and shall contain the name or initials of the Designer.

#### 1.05 MEASUREMENT AND PAYMENT

- A. Purchasing, transporting and installation of all trees, plants and shrubs will be paid as part of the lump sum prices bid for associated work. The price bid shall include all appurtenant work and materials to supply and install tree/shrub container plants including but not limited to confirmation of availability and sources, meeting with a PWD Project Manager prior to installation of plants, inspecting site prior to planting, purchase and delivery of plants to site, and approved installation. Payment shall be made at completion of initial planting for each site.
- B. No payment shall be made for pre-planting maintenance and site preparation including, but not limited to, removal of trash and debris, weeding, removal of erosion control blanket, site preparation, soil loosening, or establishment of erosion and sedimentation control practices. This is considered a distributed cost.
- C. Supplying and application of Mulch shall be paid for as part of the lump sum prices bid for associated work. The price bid shall include all appurtenant work and materials to supply and install approved mulch, including but not limited to delivery and installation of organic mulch as described herein and on the Drawings.
- D. Watering and maintenance for plants for the initial eight (8) week period shall be included as part of the lump sum prices bid for associated work. The price bid shall include all

appurtenant work and materials to provide watering and maintenance of the plant and beds, including but not limited to furnishing clean water for plants, weeding, trash and sediment removal, and replacement of dead vegetation, as approved and described in Section 3 herein. Payment shall be made at time of final acceptance subsequent to the completion of maintenance activities after 8 weeks, which shall include submission of Project Status Reports and photographic documentation as outlined in Sections 01101. Project Status Reports and photographic documentation must be received by PWD before distribution of payment.

- E. Tree measurements should be taken according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements six inches (6") above ground for trees up to four-inch (4") caliper size. Measure main body of tree for height and spread; do not measure branches or roots tip to tip.

#### 1.06 CONTRACTOR QUALIFICATIONS

- A. Crew Requirements: Crews shall consist of a minimum of two workers. One (1) landscape foreperson shall be present at all times during execution of the work. The foreperson shall direct all work performed under the following sections. Notify the Department of the name and phone number of crew member with credentials outlined below, along with a contact phone number, at least five (5) business days in advance of the first day of the specified activity.
  - a. The foreperson shall have experience with at least five (5) landscape installations of similar scope and complexity and shall have a minimum of three (3) years of experience in successful completion of similar landscape installation work. The Vendor must submit a resume of the foreperson(s) who will supervise the work crew(s).
  - b. All crew certification documentation should be readily available onsite so PWD can confirm certifications during site inspections.
  - c. Multiple certifications can be held by an individual crew member to satisfy the requirements set for in these Specifications.
- B. For tree installations, one (1) crew member must have certification as an ISA Certified Arborist or PWD approved equal. The Vendor must ensure that the ISA Certified Arborist will be present during all tree installations and inspections. The Vendor must submit the Arborist's certificate number and date of expiration.
- C. For pesticide applications, one (1) crew member must have certification as a Pest and Disease Applicator, Pennsylvania State licensed, certified commercial applicator, category: Ornamental and Shade Trees, Lawn and Turf. This crew member shall be required to be present during application of pest and disease control practices. The Vendor must submit the Pesticide and Disease Applicator's License IDs for employees performing pest and disease control.
  - 1. The Vendor must submit a resume of the employee(s) who will supervise the work crew(s).
  - 2. All crew certification documentation should be readily available onsite so PWD can confirm certifications during site inspections.
  - 3. Multiple certifications can be held by an individual crew member to satisfy the requirements set for in these Specifications.



## 1.07 QUALITY ASSURANCE

- A. All plant materials shall be tagged and approved by a Project Manager if requested prior to site delivery. The Contractor shall notify PWD of planting and tagging days a minimum of seven (7) days prior.
- B. Each plant or same-species group of plants shipped to the job site must be clearly labeled with its scientific name and common name. The Contractor is responsible to check to see that the plants are correctly labeled. PWD will not accept improperly labeled plants. The Contractor is prohibited to add, alter or remove labels. The Contractor will not be paid for material that is improperly labeled or for material on which the Contractor has altered or removed the labels.

## 1.08 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown ("root ball"), with a ball size not less than the diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.
- C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than the diameter and depth recommended by ANSI Z60.1 for type and size of plant required.
- D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than the minimum root spread according to ANSI Z60.1 for type and size of plant required.
- E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.
- F. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.
- G. Finish Grade: Elevation of finished surface of planting or stormwater soil.
- H. Multi-stem trees: Trees that have shall have three or more main stems that arise from the ground from a single root crown or at a point just above the root crown.
- I. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.

- J. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- K. Planting Area: Areas to be planted.
- L. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- M. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- N. Plugs: A cylinder of medium in which a plant is grown. The term is generally used to describe seedlings and rooted cuttings which have been removed from the container but with the medium held intact by the roots.
- O. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
- P. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
- Q. Stormwater Soil: A planting soil mixture intended to provide water quality management by filtering stormwater runoff and provide sufficient infiltration for management of specified quantities of surface water flows.
- R. Subgrade: Surface or elevation of subsoil remaining after completing excavation or backfill immediately beneath planting soil or lightweight fill material, that is integrated with Specified Soil or Growing Media by tilling in a layer of Transition Mix.

#### 1.09 INSPECTION OF PLANT MATERIALS

- A. PWD may observe plants and trees at supplier before delivery to site for compliance with requirements for genus, species, variety, size, and quality. PWD reserves the right to be present for inspection of plants at nursery and may attach their seal to each plant. The Contractor is responsible for paying any up charge for PWD to attach their seal to specific plants.
- B. PWD shall be present at time of delivery to inspect plants and trees delivered to the site. A Project Manager retains the right to inspect or reject substandard plants or trees for size and condition of balls and root systems, insects, injuries, latent defects, and speciation, and to reject unsatisfactory or defective material at any time during progress of work. Rejected plants and trees must be removed immediately from the project site.
- C. The Contractor shall spray paint the plant layout for approval by PWD. No plants or trees may be planted without on-site approval by PWD.
- D. All plants shall be labeled by tree name (genus, species, and cultivar), and all labels securely attached to individual trees upon delivery to the jobsite.

#### 1.10 DELIVERY, STORAGE AND HANDLING

- A. The Contractor shall confine the storage of material and equipment to locations approved by PWD.

- B. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.
- C. Bulk Materials:
  1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
  2. Accompany each delivery of bulk materials with appropriate certificates.
- D. Materials shall not be dropped or dumped from vehicles. Materials shall be reviewed for compliance with specified requirements. Unacceptable materials shall be removed and disposed from the job site. Materials shall be stored in designated areas.
- E. Deliver plants freshly dug. Do not prune trees and shrubs, except as directed by PWD. Protect bark, branches, and root system from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during delivery. Carefully handle all trees and shrubs during delivery to avoid mechanical damage. Handle all planting stock by the root ball. After delivery, set plants in a location protected from sun and wind. Provide adequate water to the root ball package during shipping and storage.
- F. Roots of plants shall be adequately protected at all times from sun and from drying winds.
- G. Plants which cannot be planted immediately upon delivery shall be set on the ground, out of direct sun if possible, and be well-protected with soil, mulch, or other acceptable material. Plant materials shall not be stored on site for more than one (1) day. It is the Contractor's responsibility to keep plants watered and maintained upon delivery to site; give plants enough water so that the entire soil mass is wet and water is draining out the pot bottom. It is the Contractor's responsibility to secure plants from theft and vandalism.
- H. No tree shall be planted if the root ball is cracked, broken, or dropped either before or during the planting process. No container plants will be accepted if the container is cracked or broken except upon special approval of PWD.
- I. Deliver plants on day of installation after preparations for installation have been completed. A Project Manager shall be onsite to approve condition and specification of delivered trees and plant layout.

#### 1.11 PROJECT CONDITIONS

- A. Restrictions: Planting shall only be performed during the periods within the seasons which are normal for such work as determined by weather and by locally acceptable practice and which are approved by PWD. No planting shall be performed between acceptable planting periods unless otherwise approved by PWD. The Contractor shall schedule his work to conform to these requirements. Planting close to the end of the season should be avoided if possible to maximize favorable planting conditions.
  1. Spring Planting: March 15 – June 15.
  2. Fall Planting: September 15 – December 15.
- B. Weather Limitations: Proceed with planting activities only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions and according to

manufacturer's written instructions. PWD reserves the right to postpone planting activities due to unfavorable weather conditions.

1. During periods of drought, irrigation shall be provided as approved by PWD. Water rates shall be equivalent to one inch (1") of rainfall per week.

C. Access over finished grade soils shall be restricted. If access is required across placed soils, Contractor shall be required to rework compacted soil areas prior to fine grading to the full depth of the placed soils as directed by PWD.

#### 1.12 REQUIREMENTS FOR WORK ON PARK PROPERTY

A. The Contractor shall obtain a permit from PP&R before starting work under this Contract on any PP&R property. The Contractor shall call two weeks in advance of any work to obtain the proper permits from PP&R Facilities and/or Project Manager. The Contractor shall contact PP&R prior to beginning any work in the Park to discuss the Contractor's plans for access to all sites.

Roger S. Tenant Jr – Park Manager

Philadelphia Parks & Recreation

One Parkway – 10<sup>th</sup> Floor

1515 Arch Street

Philadelphia PA 19102

[Roger.TenantJr@phila.gov](mailto:Roger.TenantJr@phila.gov)

215-200-7571

B. All work within Philadelphia parks shall be confined within the Limits of Disturbance as depicted on the drawings.

C. The Contractor will not be permitted to dump debris in Philadelphia parks. Debris piles shall be hauled away daily. The Contractor shall be responsible for any disposal costs at the locations the Contractor chooses. The dumping site shall be approved by a Project Manager and PP&R, if located on their land.

D. The Contractor shall take all measures necessary to keep the work area in a clean, neat condition. Excavated materials and debris shall be removed from the street and paths daily, and the area cleaned as directed by a Project Manager. Surfaces shall be sprinkled with water or otherwise treated to keep the dust laid during the work. All inlets shall be cleaned at the completion of work and as often as necessary during the course of work.

#### 1.13 SITE ACCESS

A. For each of the different areas where the Contractor needs to gain access to perform his work, the Contractor shall make arrangements with PWD in advance to access the site. These arrangements may require the construction of temporary roadways or bridges and the removal and replacement of existing structures.

#### 1.14 EXISTING STRUCTURES AND PAVING

A. It is expected the Contractor will prepare their own preconstruction documentation in addition to the City's own photographs, to verify the original site conditions and the

immediate vicinity of the project areas. The Contractor shall provide a set of preconstruction photographs to PWD.

- B. Any disturbed paving or curb, footway or driveway shall be restored according to any instructions provided by the Philadelphia Streets Department. All disturbed surfaces outside of the Streets Department restoration area shall be restored in kind.

#### 1.15 MAINTENANCE SERVICE

- A. Planting Maintenance: Provide maintenance of all planted areas, including watering as required in Part 3 herein. Begin maintenance immediately after plantings are installed and continue for an eight (8) week period.
- B. Site Maintenance: Provide maintenance of SMP areas, including planted areas, pretreatment devices, and five (5) feet upstream of all inlets. Maintain as required in Part 3 herein. Begin maintenance the day plantings are installed and continue for an eight (8) week period.

#### 1.16 INSPECTION FOR PLANTING CERTIFICATION

- A. Planting certification for provisional approval shall be determined by PWD on a site by site basis. Certification shall verify that the plants are in healthy condition at the time of inspection, that the planting methodology appears correct, and that the plants should be expected to survive as installed by the Contractor. Certification shall be made by a designee of PWD that has experience locally installing plants of similar types used in the project. Individual plantings or entire areas or species may be rejected at this time for certification. PWD reserves the right to determine remediation required in the event of non-certified plantings, up to and including full replacement.
- B. A Project Manager will perform inspection on a site by site basis at the end of the eight (8)-week maintenance period and upon the written request of the Contractor received at least ten (10) calendar days before the anticipated date of inspection.
- C. At the end of the maintenance period, the Contractor shall be responsible for replacement planting for any plants that are missing, dead, not true to name or size as specified, or not in satisfactory growth, as determined by PWD. Any determination made by a Project Manager regarding plant replacement shall be final, and the Contractor shall be responsible for replacing the plantings in kind (unless otherwise directed) as soon as weather conditions permit during the next appropriate planting season at no additional cost to the City. The Contractor shall not be responsible for damage or plant mortality due to vandalism.
- D. The Contractor shall prepare a list of items to be completed or corrected for review by PWD. Upon completion of the inspection, PWD shall amend the list of items to be completed or corrected. Corrective work shall be completed within two (2) weeks of receipt of the list of items needing correction or completion.
- E. After all necessary corrective work has been completed and approved by PWD subsequent to required maintenance period(s), PWD shall certify in writing the planting certification and the one-year warranty period will commence.
- F. Should approval of work be delayed after the end of the maintenance period(s) has elapsed, the Contractor shall continue maintenance activities until such approval is granted.

#### 1.17 WARRANTY PERIOD AND REPLACEMENTS

- A. The Contractor shall warranty that plant material is properly handled and installed. The Contractor shall be responsible for replacement planting required for a period of twelve (12) months after a planting is certified. At the end of the warranty period, plants that are missing, dead, not true to name or size as specified, or not in satisfactory growth, as determined by PWD, shall be replaced within the quantity limits set forth in section 1.13.D below. Any determination made by a Project Manager regarding plant replacement shall be final, and the Contractor shall be responsible for replacing the plantings in kind (unless otherwise directed) as soon as weather conditions permit during the next appropriate planting season at no additional cost to the City. The Contractor shall not be responsible for damage or plant mortality due to vandalism.
- B. All replacement of plants and trees shall be conducted in accordance with the material and construction (including schedule) in these Specifications.
- C. Replace any trees or shrubs that are more than twenty-five percent (25%) dead or in unhealthy condition at end of warranty period, as determined by Project Manager. Reseed herbaceous cover that is less than eighty-five percent (85%) alive at end of warranty period.

#### 1.18 FINAL INSPECTION AND FINAL ACCEPTANCE

- A. At the end of the warranty period, final inspection will be made by a Project Manager. PWD will request the Contractor to attend the site inspection at least ten (10) calendar days before the anticipated date of inspection.
- B. Upon completion of the inspection, PWD shall provide a list of items to be completed or corrected. Corrective work shall be completed within two (2) weeks of receipt of items needing correction or completion.
- C. After all necessary corrective work has been completed, a Project Manager will certify in writing the final acceptance of planting.

### PART 2 PRODUCTS

#### 2.01 PLANT CONDITIONERS

- A. Weed Retarder: "Preen and Green" or equal, delivered in manufacturer's containers and used according to manufacturer's instructions for off-street planting. Mechanical weeding is strongly preferred.
- B. Water used in this work shall be furnished by the Contractor and shall be suitable for irrigation and free from ingredients harmful to plant life. Hose and other watering equipment required for the work shall be furnished by the Contractor.

#### 2.02 PLANT MATERIALS

- A. Furnish and install plants, and pre-tagged and approved trees, as shown on the Drawings and specified herein. Plants shall be nursery grown under climatic conditions similar to those in the locality of the project and shall conform to the variety and sizes indicated. Plant material not obtained from an approved source is prohibited.
- B. Plants shall conform to the indicated botanical names and standards of size, culture and quality for the highest grades and standards as adopted by the ANSI Z60.1 - American Standard for Nursery Stock. All plants shall meet specified sizes and be provided as plugs, container grown, field potted, or field balled and burlapped materials as specified.

1. All single-stem trees must have a straight trunk, well-balanced crown, and intact leader. Branching height (height of the lowest living branch) must be one-third to one-half ( $\frac{1}{3}$  -  $\frac{1}{2}$ ) of tree height. Shrubs must be multi-stemmed with a well-balanced crown.
2. Tree measurements should be taken with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take height measurements from or near the top of the root flare for field-grown stock and container grown stock. Measure main body of tree for height and spread; do not measure branches or roots tip to tip. Take caliper measurements six inches (6") above root flare for trees up to four-inch (4") caliper size and 12 inches (12") above the root flare for larger sizes.
3. All trees are to be a minimum of two inches (2") caliper and balled and burlapped, or as specified in the landscaping drawings. Shrubs must be in a three (3) gallon container minimum and at least three to four feet (3-4') feet tall, or as specified in the landscaping drawings.
4. All container grown materials shall be grown to specified size in a container and shall be healthy, vigorous, well rooted and established in the container in which they are growing. A container grown plant shall have a well-established root system reaching the sides of the containers to maintain a firm root ball, but shall not have excessive root growth encircling the inside of the container.
5. Measure container materials with stems, petioles, and foliage in their normal position. Plants shall be of sufficient dimensions to include most of the fibrous roots and conforming to the standards of the AAN and ANSI Z60.1.
6. Plugs shall be cut into square or round plugs, strongly rooted, and capable of vigorous growth and development when planted; Plug Size: three (3) inches.

C. Plants shall be freshly dug for delivery. No heeled in plants or plants from cold storage shall be accepted. All plants shall be sound, healthy, well branched, and free of disease or pests. Plants shall be free of physical damage such as bark abrasions, disfiguring knots, sunscald, or unhealed cuts over three-quarters of an inch ( $\frac{3}{4}$ "). Trees with multiple leaders shall not be accepted. Plants or trees with girdling root systems shall not be accepted.

D. Plants larger than those shown in the planting schedule on the Drawings may be used, if approved by a Project Manager, but use of such plants shall be at no additional cost to PWD. If the use of larger plants is approved, the spread of roots or ball of earth shall be increased in proportion to the size of the plant as approved and in accordance with ANSI Z60.1.

E. All plants shall be grown on their own roots. Grafted materials are only acceptable if grafted at least twelve (12) months before use, unless otherwise specified.

F. Plant material not obtained from an approved source is prohibited.

G. Substitutions for plant species or cultivars may be requested if plant is not available within one hundred (100) miles of Philadelphia. Contractor must request substitutions prior to planting and final species and cultivars must be approved by PWD.

### 2.03 MULCH

A. Organic mulch shall be double-shredded well-composted, hardwood bark, aged six (6) months to one year. Size shall be a maximum width or length of two inches (2") and a

minimum of a half inch (½”) in width or length. Mulch shall be free of wood chips, stones or other undesirable matter. Mulch shall be natural hardwood color. Dyes shall not be permitted.

1. Source: The Contractor is reminded that mulch generally meeting these requirements is available for purchase from the Fairmount Park Organic Recycling Center, 3850 Ford Road, Philadelphia, (215) 685-0108.
2. Other supplier conforming to organic mulch requirements above.

#### 2.04 TREE WRAP

- A. Contractor shall use tree wrap on trees only when specifically directed by PWD. Where directed by PWD, tree wrap shall be woven polypropylene fabric such as Eaton’s 100% Woven Tree Wrap or equal. When used, tree wrap shall be installed on each tree immediately after planting.

#### 2.05 TREE-STABILIZATION MATERIALS

- A. Trunk-Stabilization Materials:
  1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated, pointed at one end.
  2. Wood Deadmen: Timbers measuring 8 inches in diameter and 48 inches long, treated with specified wood pressure-preservative treatment.
  3. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes.
  4. Guys and Tie Wires: ASTM A641/A 641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch (2.7 mm) in diameter.
  5. Tree-Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.

#### 2.07 WATER

- A. Water used in this work shall be furnished by the Contractor and shall be suitable for irrigation and free from ingredients harmful to plant life. Hose and other watering equipment required for the work shall be furnished by the Contractor.
- B. The use of hydrogels (in soil mixes or directly applied to plant roots) is prohibited in any green stormwater infrastructure system.

### PART 3 EXECUTION

#### 3.07 GENERAL

- A. Planting, mulching and conditioning shall only be performed during those periods within the seasons which are normal for such work as determined by the weather and locally accepted practice, as approved by PWD and set forth in Section 1.10 herein.
- B. Protect adjacent and adjoining structures, utilities, walks, pavements, fences and other facilities, trees, shrubs, mulched beds, plantings, and mulched areas from damage caused by planting operations. Any damages to infrastructure shall be repaired by the Contractor at no cost to PWD.
- A. Schedules for planting shall be submitted to PWD for approval at least one (1) month prior to the start of the upcoming planting season. The Contractor shall notify PWD of plant tagging and planting days with a minimum of seven (7) days’ notice. In the event of inclement



weather, planting should occur when conditions permit. In the event of rain, specifically, planting should occur the following day.

- C. The Contractor shall stake out locations of trees and secure approval of layout prior to planting.

### 3.08 EXAMINATION

- A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance of the Work.
  1. The Contractor shall review details of existing subsurface infrastructure to ensure digging or staking does not damage existing infrastructure. Contractor is responsible for costs to repair any damage to subsurface infrastructure caused by planting or staking operations.
  2. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
  3. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
  4. Review details of subsurface infrastructure to ensure digging or staking does not interfere with other assets.
  5. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
  6. Uniformly moisten excessively dry soil that is not workable or which is dusty.
- B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Project Manager and replace with new stormwater soil.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.09 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, other facilities, trees, shrubs, mulched beds, plantings, turf areas, and existing plants from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. All plants shall be installed at locations as shown on the Drawings. The Contractor shall stake out locations, outline areas, and obtain a Project Manager's approval of layout before excavating or planting. Make minor adjustments as required.

### 3.10 MINOR GRADING AND FILL

- A. See Section 02830 for requirements of placement and grading of planting and stormwater soils.
- B. The addition of soil may be required given the condition of the site as directed by PWD. Minor grading shall take place following the addition of soil, or as deemed necessary by PWD.

- C. Protect newly graded soils from traffic, freezing and erosion. Keep soils free of trash, debris or construction materials from other work.
- D. Repair and re-establish grades to specified tolerances where completed surfaces become eroded, rutted, settled, or over compacted due to subsequent construction operations or weather conditions.
- E. Scarify or remove and replace material to a depth as directed by PWD.
- F. Where settling occurs, before final acceptance, remove mulch and backfill with additional approved soil, compact to specified density.
- G. Finished grades to be landscaped or seeded shall include a minimum stormwater layer of six inches (6"). Finished grades to be otherwise surfaced shall allow sufficient elevation for the completed surface to produce the finished grades and elevations as shown on the Drawings.

### 3.11 INSTALLATION OF IN-SITU COMPOST AMENDMENT

- A. After Stormwater Soil or Planting Soil are installed in planting bed areas and just prior to the installation of shrub or groundcover plantings, spread three (3) to four (4) inches of Compost over the beds and roto till into the top four (4) to six (6) inches of the Stormwater Soil or Planting Soil. This step will raise grades slightly above the grades required for fine grading. This specification anticipates that the raise in grade due to this tilling will settle within a few months after installation as Compost breaks down.

### 3.12 PLANTING OPERATIONS

- A. Planting shall be done by experienced workmen familiar with planting procedures under the supervision of a qualified foreman.
- B. The Contractor shall make all efforts to not destroy soil structure by excessive traffic, working, or compacting the soil throughout the planting operation. Utilize the smallest practicable piece of low ground pressure mechanical equipment in the adjacent areas.
- C. To prevent potential for plant settlement, do not over-excavate prior to planting.
- D. Stormwater soil shall be backfilled in lightly compacted layers of not more than nine inches (9") and each layer watered sufficiently to settle before the next layer is put in place.
- E. If more than two (2) days elapse following preparation of stormwater soil, then the Contractor shall be responsible for regrading and loosening areas before planting.
- F. Compost shall be added prior to planting.
- G. Plants which cannot be planted immediately upon delivery shall be set on the ground, out of direct sun when possible, and be well-protected with soil, mulch, or other acceptable material. Plant materials shall not be stored on site for more than one (1) day prior to planting. It is the Contractor's responsibility to keep plants watered and maintained upon delivery to site; give plants enough water so that the entire soil mass is wet and water is draining out the pot bottom. Secure plants from theft and vandalism.
- H. PWD reserves the right to reject a plant or group of plants at any time during the project.
- I. Watering must occur immediately after planting.

### 3.13 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches

1. Excavate circular planting pits with sides sloping inward at a 45-degree angle where possible, or as indicated in planting detail drawings. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
  2. Excavate approximately three times as wide as ball diameter for planting stock where possible, or as indicated in tree planting detail drawings.
  3. For bare root stock, excavate at least 12 inches wider than root spread or as indicated on the drawings, whichever is the greater dimension and deep enough to accommodate vertical roots.
  4. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball
  5. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling; the root flare must be visible for planted trees.
  6. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
  7. Maintain supervision of excavations during working hours.
  8. Keep excavations covered or otherwise protected when unattended by Installer's personnel.
  9. If drain tile is indicated on Drawings or required under planting areas, excavate to top of porous backfill over tile.
- B. Backfill Soil: Topsoil, planting soil, or stormwater soil removed from excavations may be used as backfill soil unless otherwise indicated.
- C. Obstructions: Notify PWD if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations
1. Hardpan Layer: Drill 6-inch-diameter holes, 24 inches apart, into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.
- D. Drainage:
1. Notify Project Manager/Contracting Officer if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.
  2. Verify by testing that pits are free draining. If pits are not free draining notify PWD and submit alternative method of drainage for approval
- 3.14 INSTALLATION OF TREES AND CONTAINER SHRUBS
- A. Remove all debris from the pit and tamp loose soil in the bottom of the pit by hand.
  - B. Do not handle the plant by the trunk, branches, leaves or stem.
  - C. Place the plant straight in the center of the planting pit, carrying the plant by the root mass.
  - D. Carefully cut and remove all of the wire baskets that are packaging the root system using the least amount of disturbance as possible.

- E. Cut and remove all ropes around the burlapped ball. Remove all nails. Remove all burlap, wires, and/or other materials from the planting hole.
- F. When planting container plants, scarify the sides and bottom of the root mass such that no roots continue to circle around the root mass. When possible, pull encircling roots away from root mass and position them in the soil around the planting hole such that they are being pulled away from the plant.
- G. Backfill planting pit with soil and tamp firmly to fill all voids and air pockets. Do not over compact soil (backfilled soil should have a maximum bulk density of 1.5g/cm<sup>3</sup>). Make sure plant remains straight during backfilling/tamping procedure.
- H. The top of the root mass of the trees/shrubs should be flush with, or slightly elevated (no more than 1/8th its height) above the final grade. Do not cover stem with soil or mulch.
- I. When planting on a slope, plant “out-of-the-hill” by raising the grade around the planted hole so it is flat at the surface. Do not plant “into-the-hill” by lowering the grade and do not leave the grade at an angle.
- J. Water plants thoroughly at their bases immediately after planting to saturate backfill. Watering shall occur of a sufficient quantity to saturate the backfill and shall be applied slowly enough to sink into the soil avoiding runoff.
- K. Install slow-release watering bags on all trees such as Treegator or equivalent with at least 15 gallon capacity. Fill watering bags during maintenance.
- L. A layer of mulch should be placed around each tree and shrub installed as set forth in herein and as indicated in planting detail drawings.
- M. The Contractor shall leave no open planting pits at the close of each day.
- N. A woven polypropylene tree wrap shall be used to protect trees from deer damage if so directed by PWD. Tree wrap shall be installed on each tree immediately after planting.
- O. Maintain protection of trees during installation and maintenance periods. Treat, repair or replace any damaged planting.
- P. During planting, all areas shall be kept neat, clean and free of all trash and debris, and all reasonable precautions shall be taken to avoid damage to existing plants, turf, structures, and private property.
- Q. Remove all tags, labels, strings and wire from the plant materials, unless otherwise directed by PWD.
- R. Promptly remove soil debris created by work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks or other paved areas.
- S. Final cleanup shall be the responsibility of the Contractor and consist of removing all trash and materials incidental to the project and disposing of them off-site.
- T. When planting on side slopes, grade shall be raised to provide a level surface for planting.

### 3.15 PROTECTION OF TREES

- A. Refer to section 01535 for Tree Protection requirements.

### 3.16 TREE REMOVAL

- A. Refer to section 01535 for Tree Removal requirements.

### 3.17 TRIMMING AND PRUNING

- A. Each plant shall be trimmed in accordance with AAN and ANSI Z60.1 standards to preserve the natural character of the plant and as directed by PWD.
- B. Trimming and pruning shall be done with clean, sharp tools.

### 3.18 TREE STABILIZATION

- A. Trunk Stabilization by Upright Staking and Tying: Install trunk stabilization as follows unless otherwise indicated:

- 1. Place stakes as low as possible, no higher than  $\frac{2}{3}$  the height of the tree.
- 2. Stake trees with two stakes for trees up to 12 feet high and 2-1/2 inches or less in caliper; three stakes for trees less than 14 feet high and up to 4 inches in caliper. Space stakes equally around trees.
- 3. Materials used to tie the tree to the stake should be flexible and allow for movement all the way down to the ground so that trunk taper develops correctly.
- 4. Support trees with bands of flexible ties at contact points with tree trunk. Support trees with two strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

- B. Trunk Stabilization by Staking and Guying: Stake and guy trees more than 14 feet in height and more than 3 inches in caliper unless otherwise indicated. Install trunk stabilization as follows:

- 1. Site-Fabricated, Staking-and-Guying Method: Install no fewer than three guys spaced equally around tree.
  - a. Securely attach guys to stakes 30 inches long, driven to grade. Adjust spacing to avoid penetrating root balls or root masses. Provide turnbuckle for each guy wire and tighten securely.
  - b. Support trees with bands of flexible ties at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
  - c. Attach flags to each guy wire, 30 inches above finish grade.
  - d. Paint turnbuckles with luminescent white paint

- C. No staking shall be performed without full understanding of subsurface infrastructure locations.

### 3.19 GRASS, HERBACEOUS, AND BULB PLANTINGS

- A. Set out and space plants as indicated on Drawings in even rows with triangular spacing.
- B. Install plants after stapled erosion control blanket is removed unless otherwise directed by PWD. For areas where erosion control must remain in place, cut a hole for each plug or plant to match the diameter of the container.
- C. When planting on a slope, plant “out-of-the-hill” by raising the grade around the planted hole so it is flat at the surface. Do not plant “into-the-hill” by lowering the grade and do not leave the grade at an angle.

- D. Remove the plants and soil from the pots and carefully break apart bound root balls. Position each plant in its hole so that the soil level of each plant is flush to the surrounding finished grade soil surface. After planting, fill soil in around the plant completely, firming the soil and ensuring there are no air pockets as plants are installed. When planted, cover the top of the potted soil mix with about ½-in of stormwater soil to match surrounding finished grades and help reduce wicking of moisture out of the potted soil mix. Water installed plants immediately after planting. Where specified on the Drawings, install mulch as directed.

### 3.20 PLANTING AREA MULCHING

- A. Immediately after planting operations are completed, planting beds shall be covered with the specified mulch as indicated.
  - 1. For Continuous Planting Areas: Apply 3-inch average thickness of organic mulch extending 12 inches beyond edge of individual planting and over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within three inches (3") of trunks or stems and off of leaves or stems for container plants and plugs. Planting beds that are within infiltration areas or channels shall be mulched to one-inch (1") depth.

### 3.21 WATERING

- A. All plants shall be watered the same day as planting and not less than twice per week until provisional acceptance. All plants shall be watered at the roots, to minimize wetting of the leaves. Water shall be released slowly to prevent runoff and in sufficient quantity to saturate the soils (approximately fifteen to twenty (15-20) gallons per watering). In the event of steady rainfall, frost, or yellowing of the leaves, watering may be temporarily reduced with the approval of PWD.
- B. Suitable water for planting and maintenance will be the responsibility of the Contractor. The Contractor shall furnish his own hose and hose connections or other watering equipment.
- C. See Table of Maintenance Tasks and Schedule for further watering requirements.

### 3.22 SITE RESTORATION

- A. General
  - 1. Restore all disturbed areas to the satisfaction of PWD.
  - 2. Backfill all disturbed areas outside the Limits of Disturbance to original elevation and slope. Ensure stability of reconstructed slopes. On steep slopes, provide and arrange logs, large rocks or other devices to check erosion. Slope areas shall be seeded with the specified seed mix. The entire disturbed area of the slope shall be covered with erosion control blanket to prevent erosion. The fabric shall be pinned to the slope at 3-three foot (3') intervals.
  - 3. Restore all disturbed trenches, rubble gutters, bridle paths, asphalt paths, cinder roads, stone walls, structures, utilities, sidewalks and other fixtures in kind, to original condition, and to the satisfaction of PWD.

### 3.23 MAINTENANCE

- A. Maintenance for provisional acceptance shall begin immediately after planting is installed and completed on a site by site basis. Contractor will begin a formalized cyclical

maintenance program that will last until the end of the maintenance period of eight (8) weeks.

- B. Proposed maintenance activities and schedule shall be coordinated with PWD and shall be in accordance with the program submitted by the Contractor based on Table of Provisional Maintenance Tasks and Schedules below.
- C. Planting beds shall be watered, mulched, weeded, pruned, and sprayed as described herein and otherwise maintained and protected during this period. Dead or damaged plants shall be replaced before the end of the provisional maintenance period. Maintenance activities are outlined in the table below.
- D. Submit Monthly Project Status Reports using the template in Appendix M detailing the completed maintenance activities.
- E. Site inspection for provisional approval shall take place at the end of the eight (8) week period. The Contractor shall coordinate the site inspection with PWD ten (10) calendar days prior to the anticipated date of inspection. Should approval by PWD be delayed until after the 8-week period has elapsed, the Contractor is responsible for continuing maintenance activities until such approval is granted.
- F. Table of Provisional Maintenance Tasks and Schedules:

<b>Task</b>	<b>Description</b>	<b>Frequency</b>
Remove trash, sediment and organic debris	Remove trash, sediment, and organic debris from all SMP surfaces	Weekly
	Clean pretreatment devices; empty filter bags for inlets, domed rises or other structures. Sweep or vacuum at least five (5) ft. one either side of inlets or curb cuts.	Monthly
Remove non-target/invasive vegetation	Remove all non-target or invasive vegetation not part of the original planting. Weeds shall be disposed of offsite in an approved manner. Application of weed retardants may be used as approved by PWD.	Monthly, from March to December

<b>Task</b>	<b>Description</b>	<b>Frequency</b>
Water vegetation	Place and fill 15-20 gallon water bags such as Treegator® or equivalent on trees. Follow directions of manufacturer. Replace bags if they become damaged or missing.	Weekly
	Water shrubs and herbaceous plants at the base of the plant with a hose or ground-level irrigation system. Natural rainfall is not considered a watering as it will not provide the required depth of water. Each watering should slowly soak the entire depth of root system.	3 times per week on dry days; no later than 3-4 hours from dusk. Watering with an overhead system is only permitted when weather is overcast.
	Water groundcover and plugs - do not allow soil to dry out. Provide a half-inch (0.5") of water at each watering.	Daily, when there is no rainfall for first 6 weeks; twice weekly thereafter
Apply insecticides or other chemicals	Apply insecticides or other chemicals	As approved by PWD
Prune trees and shrubs	Remove dead, damaged, or diseased wood	As needed during Provisional Maintenance period; should be completed prior to Final PWD Inspection and Walk-through
Replace tree stakes	Replace or amend tree stakes or tree protection	As needed during Provisional Maintenance period; should be completed prior to Final PWD Inspection and Walk-through



<b>Task</b>	<b>Description</b>	<b>Frequency</b>
Apply mulch	Apply mulch to landscaped beds as needed to maintain three-inch (3") depth; extending from the edge of the bed or pit to a radius of three inches (3") from the stem of each plant. Mulch shall not touch the woody stem of a shrub or tree. When there is more than a one-inch (1") drop from the edge of the pavement to the mulch, add mulch to reduce the gap to a minimum of a half-inch (0.5") from the edge of the pavement.	As needed during Provisional Maintenance period; should be completed prior to Final PWD Inspection and Walk-through
Reset elevation of plants	Reset settled plants to proper grade and position	As needed during Provisional Maintenance period; should be completed prior to Final PWD Inspection and Walk-through
Replace dead or damaged plants	Replace trees or shrubs that are more than 10% dead and herbaceous massings with more than 10% death	As needed after Provisional Maintenance period; If replacement is required, an additional 8-week Provisional Maintenance Period is required

END OF SECTION

## SECTION 02920

### TURF AND GRASSES WITHIN PUBLIC RIGHT-OF-WAY

#### PART 1 GENERAL

##### 1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to complete all planting and related landscaping work indicated on the Drawings and as specified herein, including but not necessarily limited to the following:
  - 1. Seeding Turf.
  - 2. Sodding.
  - 3. Turf renovation.
  - 4. Erosion-control material(s).
  - 5. Supplying and application of mulch as specified herein.
  - 6. Final cleanup and all other work required to complete the job in accordance with the Drawings and Specifications.
  - 7. Providing an eight week proposed maintenance program and one year replacement guarantee for all plantings.
  - 8. Monthly status reporting of completed planted and maintenance activities.
  - 9. Provision of "As Planted" record drawings.

##### 1.02 RELATED SECTIONS

- A. Section 01110 Photographic Documentation
- B. Section 01535 Tree Protection
- C. Section 02135 Erosion and Sedimentation Control
- D. Section 02830 Green Stormwater Infrastructure Soils
- E. Section 02900 Planting

##### 1.03 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials (AASHTO)
- B. Turfgrass Producers International "Guideline Specifications to Turfgrass Sodding", sections including:
  - 1. Specifications for Turfgrass Sod Materials
  - 2. Specifications for Turfgrass Sod Transplanting and Installation
- C. Other Agencies
  - 1. Philadelphia Parks and Recreation Department (PP&R) (previously Fairmount Park Commission) Contractor Guidelines.
  - 2. Philadelphia Streets Department, Standard Construction Items.
  - 3. Pennsylvania Department of Transportation, Form 408 Specifications.

4. Association of Official Seed Analysts (AOSA)

5. Turfgrass Producers International (TPI)

D. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

#### 1.04 SUBMITTALS

A. Submit complete product data for all materials furnished under this Section. One set of complete submittals is required per planting season. Any changes to materials require resubmittal.

B. Submit qualifications of crew, equipment, and suppliers using the Landscaping Qualifications Form in Appendix L. Qualifications must conform with the requirements detailed in Section 1.06, Contractor Qualifications.

C. Samples, testing and certifications of all materials shall be submitted for inspection and acceptance upon PWD's request. None of the landscaping materials shall be delivered to the site until samples and test results in accordance with the specifications within are approved by PWD; however, such approval does not constitute final acceptance.

1. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

2. Certification of each seed mixture for turfgrass sod or plugs. Include identification of source and name and telephone number of supplier.

D. Submit a proposed list of seed mixes, grasses, sedge or turf species with botanical and common names, variety, size, quantity, and source of plant materials in the varieties, sizes, and quantities indicated on the Drawings at least three (3) months prior to the proposed planting date. Sources of planting materials must be confirmed by the Contractor, and written documentation of plant availability in accordance with the submitted planting schedule shall be provided by the supplier(s). Substitutions may be permitted only after substantiated written confirmation and documentation is submitted that a specified plant is not obtainable, and approval of each substitution is approved by PWD.

E. Submit a schedule for planting of grasses and turf at least three (3) months prior to the start of the upcoming planting season. Planting schedule shall take into account allotted days for completion of the Work in the Contract, and any extensions of the time allotment to be made for accommodation of planting seasons may be made at the sole discretion of PWD. No work shall be performed until these documents are approved by PWD.

F. Submit Monthly Project Status Reports using the template in Appendix M. Project Status Reports shall list detail all planting, maintenance activities, and upcoming site work. Photographic documentation shall be included with the Monthly Project Status Report in accordance with Section 01110 (Photographic Documentation) of these Specifications. Project Status Reports shall be submitted within one (1) week of the end of each month.

G. Sketch plans, photographs, and written documentation of all plant installations, including initial planting and any plant replacements during the eight (8)-week maintenance period shall be submitted for approval within one (1) week of provisional acceptance subsequent to the maintenance period.

1. Sketch plans must include a revised schedule with species (botanical name) and cultivars and final quantities along with a revised planting plan.
2. Landscape sketch plans may be a markup of the original landscaping plan. Changes to the original landscaping plan shall be clearly noted and shown in red.
3. All sketches shall be labeled "As Planted", dated, and shall contain the name or initials of the Designer.

#### 1.05 MEASUREMENT AND PAYMENT

- A. Seeding, or sodding for areas indicated to be grass on the Drawings or existing turf, disturbed during construction, shall be paid as part of the lump sum prices bid for associated work. The price bid shall include but not be limited to procurement, delivery, and installation of seed or sod as specified, provision of at least six inches (6") of topsoil and amendments as needed, fertilizers, and any and all appurtenant work or materials required to provide viable grassed areas.
- B. No payment shall be made for pre-planting maintenance and site preparation including, but not limited to, removal of trash and debris, removal of erosion control blanket, site preparation, soil loosening, or establishment of erosion and sedimentation control practices. This is considered a distributed cost.
- A. Watering and Maintenance for the initial eight (8) week period for turf and grasses shall be included as part of the lump sum prices bid for associated work. The price bid shall include all appurtenant work and materials to provide watering and maintenance of the turf and grasses, including but not limited to furnishing clean water for plants and maintenance as approved and described in Section 3 herein. Payment shall be made at time of provisional acceptance subsequent to the completion of maintenance activities for each site, which shall include submission of Project Status Reports and photographic documentation as outlined in Sections 01110. Project Status Reports and photographic documentation must be received by PWD before distribution of payment.

#### 1.06 CONTRACTOR QUALIFICATIONS

- A. Crews shall consist of a minimum of two workers. One (1) landscape foreperson shall be present at all times during execution of the work. The foreperson shall direct all work performed under the following sections. Notify the Department of the name and phone number of crew member with credentials outlined below, along with a contact phone number, at least five (5) business days in advance of the first day of the specified activity.
  1. The foreperson shall have experience with at least five (5) landscape installations of similar scope and complexity and shall have a minimum of three (3) years of experience in successful completion of similar landscape installation work. The Vendor must submit a resume of the foreperson(s) who will supervise the work crew(s).
  2. All crew certification documentation should be readily available onsite so PWD can confirm certifications during site inspections.
  3. Multiple certifications can be held by an individual crew member to satisfy the requirements set for in these Specifications.
- B. For turf installation, installers shall be familiar with lawn construction under the supervision of an experienced landscape foreman at all times during the construction. One (1) crew member must be a Certified Turfgrass Professional, designated CTP.

- C. For pesticide applications, one (1) crew member must have certification as a Pest and Disease Applicator, Pennsylvania State licensed, certified commercial applicator, category: Ornamental and Shade Trees, Lawn and Turf. This crew member shall be required to be present during application of pest and disease control practices. The Vendor must submit the Pesticide and Disease Applicator's License IDs for employees performing pest and disease control.

#### 1.07 DEFINITIONS

- A. Hydroseeding: (hydraulic mulch seeding, hydro-mulching, hydraseeding) is a planting process that uses a slurry of seed and mulch
- B. Finish Grade: Elevation of finished surface of stormwater soil.
- C. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- D. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- E. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- F. Planting Soil: Natural surface-soil or prepared planting mix layer containing organic matter and sand, silt and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil materials including, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of weeds, roots, toxic materials, or other non-soil or non-specified materials.
- G. Salvaged Topsoil: Stripped native loam removed within the limits of work, but outside of the "Tree Protection Areas", to its entire natural depth.
- H. Stormwater Soil: A planting soil mixture intended to provide water quality management by filtering stormwater runoff and provide sufficient infiltration for management of specified quantities of surface water flows.
- I. Subgrade: Surface or elevation of subsoil remaining after completing excavation or backfill immediately beneath planting soil or lightweight fill material, that is integrated with Specified Soil or Growing Media by tilling in a layer of Transition Mix.
- J. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- K. Topsoil: Topsoil shall be harvested from fields or development sites and shall be loose, friable mineral particles resulting from natural soil formation from the A, E and upper B horizons, or "solum" where most plant roots grow and as defined further herein.

#### 1.08 DELIVERY, STORAGE AND HANDLING

- A. The Contractor shall confine the storage of material and equipment to locations as approved by PWD.

- B. The Contractor must provide to PWD each of their plant suppliers' shipping lists for review and approval after ordering, but PRIOR to supplier's shipping any plant material. Only specified grasses, plugs and seed mixes will be accepted.
- C. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" sections in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.
- D. Materials shall not be dropped or dumped from vehicles. Materials shall be reviewed for compliance with specified requirements. Unacceptable materials shall be removed and disposed from the job site. Materials shall be stored in designated areas.
- E. Seed and other packaged materials shall be delivered to the site, mixed as specified, in the original unopened standard size bags showing weight, certified analysis and name and address of manufacturer and indication of conformance with state and federal laws, as applicable. Containers shall bear the manufacturer's certificate of compliance covering analysis and shall be furnished to PWD. Store bagged materials in a weatherproof place and in such a manner that it will be kept dry and its effectiveness will not be impaired.

#### 1.09 INSPECTION OF PLANT MATERIALS

- A. A Project Manager may inspect turf sod, plugs or pots at supplier before delivery to site for compliance with requirements for genus, species, variety, size, and quality.
- B. A Project Manager shall be present at time of delivery to inspect plants delivered to the site. Contractor is responsible for contacting PWD at least seven (7) days prior to site delivery to arrange inspection.
- C. PWD retains the right to inspect or reject substandard plants size and condition root systems, insects, injuries and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Rejected plants must be removed immediately from the project site.
- D. No grasses or turf may be planted without on-site approval by PWD. PWD is responsible for final approval of plant species and delivered plant materials. The Contractor is responsible for coordinating for these approvals with PWD.

#### 1.10 PROJECT CONDITIONS

- A. Restrictions: Perform planting during the periods specified herein and coordinate installation with maintenance periods to provide required maintenance activities for eight (8) weeks until provisional acceptance.
  - 1. Spring Planting: March 15 – June 15
  - 2. Fall Planting: August 15 – December 15
- B. Weather Limitations: Proceed with planting activities only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions and according to manufacturer's written instructions.
- C. Under no circumstances shall stormwater soil be worked under frozen or saturated conditions as determined by PWD.

- D. Access over finished grade soils shall be restricted. If access is required across placed soils, Contractor shall be required to rework compacted soil areas prior to fine grading to the full depth of the placed soils as directed by PWD.

E.

#### 1.11 REQUIREMENTS FOR WORK ON PARK PROPERTY

- A. The Contractor shall obtain a permit from PP&R before starting work under this Contract. The Contractor shall call two weeks in advance of any work to obtain the proper permits from PP&R Facilities and/or Project Managers. The Contractor shall contact PP&R prior to beginning any work in the Park to discuss the Contractor's plans for access to all sites.

Roger S. Tenant Jr. – Park Manager

Philadelphia Parks & Recreation

One Parkway – 10<sup>th</sup> Floor

1515 Arch Street

Philadelphia PA 19102

Roger.TenantJr@phila.gov

215-200-7571

#### 1.12 SITE ACCESS

- A. For each of the different areas where the Contractor needs to gain access to perform his work, the Contractor shall make arrangements with PWD in advance to access the site. These arrangements may require the construction of temporary roadways or bridges and the removal and replacement of existing structures.

#### 1.13 EXISTING STRUCTURES AND PAVING

- A. It is expected the Contractor will prepare his own preconstruction documentation in addition to the City's own photographs, to verify the original site conditions and the immediate vicinity of the project areas. The Contractor shall provide a set of preconstruction photographs to PWD.
- B. Any disturbed paving or curb, footway or driveway shall be restored according to any instructions provided by the Philadelphia Streets Department. All disturbed surfaces outside of the Streets Department restoration area shall be restored in kind.

#### 1.14 MAINTENANCE SERVICE

- A. Project Maintenance: Provide maintenance of sodded, seeded or planted areas by skilled employees of the landscape installer as defined under quality assurance above. Maintain as required in this Section. Begin maintenance immediately after plantings are installed and continue for an eight (8) week period, which must occur during the normal growing season.

#### 1.15 INSPECTION FOR PLANTING CERTIFICATION

- A. A Project Manager will inspect all work for provisional acceptance upon the written request of the Contractor received at least ten (10) calendar days before the anticipated date of inspection, and after the initial eight-week maintenance period has elapsed. Certification shall verify that the grasses are healthy in condition at the time of inspection, that the planting methodology appears correct, and that the grasses should be expected to survive as installed by the Contractor. Grasses

shall not be eligible for certification until (at a minimum) the initial eight (8) week maintenance period has ended. Certification shall be made by a designee of PWD that has experience locally installing native plants of similar types used in the project. Individual plantings, entire areas, or species may be rejected at this time for certification. PWD reserves the right to determine remediation required in the event of non-approved plantings, up to and including full replacement.

- B. At the end of the maintenance period, the Contractor shall be responsible for replacement planting for any grasses that are missing, dead, not true to name or size as specified, or not in satisfactory growth, as determined by PWD. Any determination made by a Project Manager regarding plant replacement shall be final, and the Contractor shall be responsible for replacing the plantings in kind (unless otherwise directed) as soon as weather conditions permit during the next appropriate planting season at no additional cost to the City. The Contractor shall not be responsible for damage or plant mortality due to vandalism.
- C. Contractor shall prepare a list of items to be completed or corrected for review by PWD. Upon completion of the inspection, PWD shall amend the list of items to be completed or corrected. Corrective work shall be completed within two (2) weeks of the requested date for completion.
- D. After all necessary corrective work has been completed and the initial eight (8) week maintenance period has elapsed, PWD shall certify in writing the planting certification and the one year guarantee period will commence.
- E. Should approval of work be delayed after the end of the maintenance period(s) has elapsed, the Contractor shall continue maintenance activities until such approval is granted.

#### 1.16 WARRANTY PERIOD AND REPLACEMENTS

- A. The Contractor shall warranty that plant material is properly handled and installed. The Contractor shall be responsible for any replacement planting or sodding required for a warranty period of twelve (12) months after a planting is approved, as determined by PWD. Any determination made by PWD regarding plant or sod replacement shall be final.
- B. At the end of the warranty period, any grass or sod area that is missing, dead, not true to name or size as specified, or not in satisfactory growth, as determined by PWD, shall be replaced. All replacements shall be plants or sod of the same kind and size as specified. They shall be furnished and planted as specified herein. The cost of replacement shall be borne by the Contractor.
- C. Turf cover is to be eighty-five percent (85%) or more at end of warranty period.
- D. If turf is less than eighty-five percent (85%), the Contractor is to reseed in accordance with the original specifications.

#### 1.17 INSPECTION AND PLANTING CERTIFICATION

- A. A Project Manager will inspect all work for provisional acceptance upon the written request of the Contractor received at least ten (10) calendar days before the anticipated date of inspection, and after the initial eight-week maintenance period has elapsed. Certification shall verify that the grasses are healthy in condition at the time of inspection, that the planting methodology appears correct, and that the grasses should be expected to survive as installed by the Contractor. Grasses shall not be eligible for certification until (at a minimum) the initial eight (8) week maintenance period has ended. Certification shall be made by a designee of PWD that has experience locally installing native plants of similar types used in the project. Individual plantings, entire areas, or



species may be rejected at this time for certification. PWD reserves the right to determine remediation required in the event of non-certified plantings, up to and including full replacement.

- B. Contractor shall furnish a full and complete written program for the eight-week maintenance program of the planting to PWD at the time of provisional acceptance for approval.
- C. Contractor shall prepare a list of items to be completed or corrected for review by PWD. Upon completion of the inspection, PWD shall amend the list of items to be completed or corrected. Work shall be completed within two (2) weeks of the requested date for completion.
- D. After all necessary corrective work has been completed and the initial eight (8) week maintenance period has elapsed, PWD shall certify in writing the planting certification and the one year guarantee period will commence.

1.18 FINAL INSPECTION AND FINAL ACCEPTANCE

- A. At the end of the warranty period, inspection will be made by PWD upon written request submitted by the landscape contractor at least ten (10) calendar days before the anticipated date.
- B. After all necessary corrective work has been completed, PWD will certify in writing the final acceptance of the planting.

PART 2 PRODUCTS

2.01 TURFGRASS SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed weights designated are for Pure Live Seed (PLS). PLS is defined as the percentage of a quantity of seed that will germinate, and can be obtained by multiplying the seed purity percentage (percentage of seed by weight that is the labeled species) by the percentage of total viable seed, then dividing by one hundred (100).
- C. Seed shall be labeled in accordance with USDA Rules and Regulations under the Federal Seed Act and applicable State seed laws, including tolerance for purity and germination established by Official Seed Analysts of North America. Seed shall be furnished in sealed bags or containers bearing the date of the last germination, which date shall be within a period of six (6) months prior to commencement of planting operations. Seed shall be from same or previous year's crop and shall have a weed content of not more than 1 percent and contain no noxious weeds. The seed mixture shall be as follows:
  - 1. Lawn Area Seed Mix shall be a blend of two fescues, for draught tolerance and ability to withstand light foot traffic as manufactured by Pennington Seed, Inc., PO Box 290 Madison, GA 30650 tel no 800 285-7333, or equal, as follows:

50%	Rebel II Tall Fescue	Festuca arundinacea
20%	Creeping Red Fescue	Festuca rubra
20%	Palmer II Perennial Ryegrass	Lolium perenne
10%	Kentucky Bluegrass	Poa pratensis

- D. The seed shall be furnished and delivered premixed in the proportions specified above, and accompanied by an affidavit. No seed may be sown until the certificates have been submitted.

## 2.02 TURFGRASS SOD

- A. Turfgrass Sod: Certified, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture that is strongly rooted and capable of vigorous growth and development when planted.
- B. Turfgrass Species: Sod of grass species as follows, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
  - 1. Full Sun: Kentucky bluegrass (*Poa pratensis*), a minimum of three cultivars.
  - 2. Sun and Partial Shade: Proportioned by weight as follows:
    - 1. 50 percent Kentucky bluegrass (*Poa pratensis*)
    - 2. 30 percent chewings red fescue (*Festuca rubra* variety)
    - 3. 10 percent perennial ryegrass (*Lolium perenne*)
    - 4. 10 percent redtop (*Agrostis alba*)
  - 3. Shade: Proportioned by weight as follows:
    - 1. 50 percent chewings red fescue (*Festuca rubra* variety)
    - 2. 35 percent rough bluegrass (*Poa trivialis*)
    - 3. 15 percent redtop (*Agrostis alba*)

## 2.03 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
- B. Organic mulch shall be double-shredded well-composted, hardwood bark, aged six (6) months to one year. Size shall be a maximum width or length of two inches (2") and a minimum of a half inch (1/2") in width or length. Mulch shall be free of wood chips, stones or other undesirable matter. Mulch shall be natural hardwood color. Dyes shall not be permitted.
  - 1. Source: The Contractor is reminded that mulch generally meeting these requirements is available for purchase from the Fairmount Park Organic Recycling Center, 3850 Ford Road, Philadelphia, (215) 685-0108.
  - 2. Other supplier conforming to organic mulch requirements above.
- C. Non-asphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.
  - 1. Tackifier shall be MULCHTACK41™MULTI-PURPOSE TACKIFIER / BINDER as manufactured by GEOchem, Incorporated, Second Nature® Wood Fiber Blend Hydraulic Mulch as manufactured by Profile Products, LLC or approved equal.

## 2.04 EROSION-CONTROL BLANKETS

- A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat with a minimum thickness of 0.25 inches (1/4"). Blanket should be designed for use on moderate slope and channel applications requiring erosion control for up to 12 months. Blanket shall meet all requirements established in FHWA FP-03 as a type 2D erosion control blanket. Include manufacturer's recommended steel wire staples, six (6) inches long.

## PART 3 EXECUTION

### 3.01 GENERAL

- A. Installation of grasses and turf shall only be performed during those periods within the seasons which are normal for such work as determined by the weather and locally accepted practice, as approved by PWD and set forth in Section 1.10 herein.
- B. Protect adjacent and adjoining structures, utilities, walks, pavements, fences and other facilities, trees, shrubs, mulched beds, plantings, and mulched areas from damage caused by seeding and turf and grass installation operations. Any damages to infrastructure shall be repaired by the Contractor at no cost to PWD.
- B. Schedules for installing grasses and turf shall be submitted to PWD for approval at least three (3) months prior to the start of the upcoming planting season. In the event of inclement weather, planting should occur when conditions permit. In the event of rain, specifically, planting should occur the following day.

### 3.02 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.
  - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
  - 2. Verify that area to be planted has at least six inches (6") of topsoil, free of glass, stones, and gravel.
  - 3. Review details of subsurface infrastructure to ensure digging does not interfere with other assets.
  - 4. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
  - 5. Uniformly moisten excessively dry soil that is not workable or which is dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by PWD and replace with new stormwater soil.

### 3.03 PREPARATION

- A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
  - 1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
  - 2. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

### 3.04 TURF AREA PREPARATION

- A. General: Prepare planting area. Reduce elevation of topsoil to allow for soil thickness of sod.

- B. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- C. Before planting, obtain Project Manager's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.
- D. Till and loosen the soil, then firm it to achieve good seed-to-soil contact.

### 3.05 PREPARATION FOR EROSION-CONTROL MATERIAL

- A. Prepare area as specified in "Turf Area Preparation" above.
- B. For erosion-control mats, install stormwater soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer.
- C. Fill cells of erosion-control mat with stormwater soil and compact before planting.
- D. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.
- E. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

### 3.06 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds five (5) mph.
- B. Seeding shall be performed during time period outlined in Site Conditions article above. No seeding shall be performed on frozen ground or when the temperature is 32°F/0°C or below.
  - 1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
  - 2. Do not use wet seed or seed that is moldy or otherwise damaged.
  - 3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- C. Sow seed at a total rate as outlined in Manufacturer's specifications.
- D. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- E. Protect seeded areas with slopes exceeding 1:4 with erosion-control blankets and 1:6 with erosion-control fiber mesh installed and stapled according to manufacturer's written instructions.
- F. Protect seeded areas with erosion-control mats where indicated on Drawings; install and anchor according to manufacturer's written instructions.
- G. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.

### 3.07 SODDING

- A. Lay sod within twenty four (24) hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.

- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to soil or sod during installation. Tamp and roll lightly to ensure contact with soil, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
  - 1. Lay sod across slopes exceeding 1:3.
  - 2. Anchor sod on slopes exceeding 1:6 with wood pegs or steel staples spaced as recommended by sod manufacturer but not less than two anchors per sod strip to prevent slippage.
- C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

### 3.08 TURF RENOVATION

- A. Renovate existing turf where indicated.
- B. Renovate turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
  - 1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
  - 2. Install new soil as required.
- C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.
- D. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new stormwater soil.
- E. Mow, dethatch, core aerate, and rake existing turf.
- F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as approved by PWD. Do not use pre-emergence herbicides.
- G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.
- H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.
- I. Water newly planted areas and keep moist until new turf is established.

### 3.09 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by PWD:
  - 1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches
  - 2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
  - 3. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

### 3.10 MAINTENANCE

- A. Maintenance for provisional acceptance shall begin immediately after each plant area is installed. Contractor will begin a formalized cyclical maintenance program that will last until the end of the maintenance period of eight (8) weeks.
- B. Proposed maintenance activities and schedule shall be coordinated with PWD and shall be in accordance with the program submitted by the Contractor based on Table of Provisional Maintenance Tasks and Schedules below.
- C. Maintain and establish turf and meadow by watering, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf and meadow. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
- D. Submit Monthly Project Status Reports using the template in Appendix M detailing the completed maintenance activities.
- E. Site inspection for provisional approval shall take place at the end of the eight (8) week period. The Contractor shall coordinate the site inspection with PWD ten (10) calendar days prior to the anticipated date of inspection. Should approval by PWD be delayed until after the 8-week period has elapsed, the Contractor is responsible for continuing maintenance activities until such approval is granted.
- F. Table of Provisional Maintenance Tasks and Schedules:

<b>Task</b>	<b>Description</b>	<b>Frequency</b>
Water vegetation	Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of four (4) inches. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch.	Several times per week as needed during Provisional Maintenance period
Water seeds and plugs	Water seeds and plugs - do not allow soil to dry out. Provide a half-inch (0.5") of water at each watering. Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of four (4) inches. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch.	Several times per week as needed during Provisional Maintenance period
Apply insecticides or other chemicals	Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards	As approved by PWD; as needed during Provisional Maintenance period

<b>Task</b>	<b>Description</b>	<b>Frequency</b>
Mow	Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height: Mow turfgrass to a height of at least 2 inches. Mow meadow grasses once during the first week of July if this date occurs during the Provisional Maintenance period.	As needed during Provisional Maintenance period
Replace dead or damaged grasses and meadow	Replace turf and mulch that has less than 85% cover	As needed during Provisional Maintenance period; should be completed prior to Final PWD Inspection and Walk-through
Remove trash, sediment and organic debris	Remove trash, sediment, and organic debris from all SMP surfaces	Weekly
	Clean pretreatment devices; empty filter bags for inlets, domed rises or other structures. Sweep or vacuum at least five (5) ft. one either side of inlets or curb cuts.	Weekly
Remove non-target vegetation	Remove all non-target or invasive vegetation not part of the original planting. Weeds shall be disposed of offsite in an approved manner. Application of weed retardants may be used as approved by PWD.	Weekly
Mulch	In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.	As needed during Provisional Maintenance period; should be completed prior to Final PWD Inspection and Walk-through

<b>Task</b>	<b>Description</b>	<b>Frequency</b>
Reset elevations	Fill in as necessary soil subsidence that may occur because of settling or other processes.	As needed during Provisional Maintenance period; should be completed prior to Final PWD Inspection and Walk-through

### 3.11 CLEANUP AND PROTECTION

- A. The Contractor shall take all measures necessary to keep the work area in a clean, neat condition. Excavated materials shall be removed from the street, and the area cleaned as directed by PWD. Surfaces shall be sprinkled with water or otherwise treated to keep the dust laid during the work. Accumulations of soil and debris on roadways and recreation paths shall be removed daily. All inlets shall be cleaned at the completion of work and as often as necessary during the course of work. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them.
- C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- D. Remove non-degradable erosion-control measures after grass establishment period.

### 3.12 SITE RESTORATION

- A. Restore all disturbed areas to the satisfaction of PWD.

END OF SECTION



## APPENDIX A - MAINTENANCE OF TRAFFIC REQUIREMENTS

- A. No work will be done in the intersections during peak hours, (6:30 a.m. to 9:00 a.m. and 4:00 p.m. to 6:30 p.m.). To avoid excessive disruption to neighborhoods, the Contractor will not be permitted to start excavation in an additional block unless approved in writing by PWD or until work in the current block has been completed to the extent satisfactory to the Water Department.
- B. During working hours establish and maintain travel lane using steel plates as necessary and during non-working hours deck all excavations with steel plates. Prior placing any steel plate, the contractor shall provide the Right of Way Unit of the Department of Streets inspector with an emergency telephone number in the event any steel plating or decking is dislodged as described in article 3.03, Steel Plate For Decking of Section 01570, Traffic Regulation. The Contractor shall note, however, that the use of steel plates in State Routes is prohibited; temporary pavement restoration shall be required to reopen areas to traffic.
- C. STREET FROM STREET TO STREET
  - 1. While working in the above streets, establish and maintain travel lanes using steel plates and flagmen as necessary to allow through traffic. (Traffic control on State Routes shall follow the requirements of PennDOT Pub. 213.) Post temporary no parking signs where necessary to establish the travel lanes, to store equipment and materials, and to maneuver equipment for installation of the proposed sewers and water mains. Maintain access to local properties and driveways at all times. Where the proposed water mains are located in the footway areas, close the footways as required but only to the extent where water main work is actually being performed. Provide a safe, alternate passageway for pedestrians around the work areas. Work with minimum disturbance to the businesses and residences in the area. During non-working hours, backfill or deck with steel plates all excavations, restore parking, and re-open the footways providing the full width use of the roadways and footways to traffic and pedestrians respectively.
  - 2. During working hours in the intersecting streets, establish and maintain travel lanes using steel plates and flagmen as necessary to allow through traffic. Where the intersecting streets are too narrow to maintain a travel lane, close that intersecting streets only for a duration of time necessary to complete the sewer and/or water main tie-ins or crossings, and restore the paving. During non-working hours, backfill or deck with steel plates all excavations providing the full width use of the intersections to traffic.

END OF REQUIREMENTS

APPENDIX B – PROJECT SIGNAGE

**GENERAL NOTES:**

THIS WORK CONSISTS OF THE MAINTENANCE OF TRAFFIC AND THE PROTECTION OF THE TRAVELING PUBLIC. PROVIDING TWO (2) POLYESTER APPROACHING THE CONSTRUCTION AREA AND WITHIN THE LIMITS OF CONSTRUCTION.

MAINTAIN ERECT, FORCE AND MAINTAIN TRAFFIC CONTROL SIGNS AND DEVICES AND MAINTAIN TRAFFIC DURING THE HOURS OF CONSTRUCTION AND AT ALL OTHER TIMES IN ACCORDANCE WITH THE METHODS INDICATED ON THE DRAWINGS AND:

1. THE SPECIAL PROVISIONS OF THE CONTRACT
2. PENNSYLVANIA PUBLIC SAFETY OFFICIAL TRAFFIC CONTROL DEVICES
3. PENNSYLVANIA PUBLIC SAFETY TEMPORARY TRAFFIC CONTROL GUIDELINES
4. FHWA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES
5. PENNSYLVANIA PUBLIC SAFETY APPROVED CONSTRUCTION MATERIALS (QUALITY TM)
6. PENNSYLVANIA PUBLIC SAFETY SPECIFICATIONS
7. PENNSYLVANIA PUBLIC SAFETY TRAFFIC CONTROL - PAVEMENT MARKING AND SIGNING STANDARDS
8. PENNSYLVANIA PUBLIC SAFETY TRAFFIC ENGINEERING MANUAL
9. PENNSYLVANIA PUBLIC SAFETY HANDBOOK OF APPROVED SIGNS

ALL SIGNS TO BE IN NEW CONDITION AND MAINTAINED AS SUCH

ALL SIGNS NOT IN USE ARE TO BE EITHER COVERED OR REMOVED FROM SITE. COVER ALL CONFLICTING EXISTING SIGNS.

ALL WORK IS TO BE PERFORMED WITHIN THE LEGAL RIGHT-OF-WAY

THIS TRAFFIC CONTROL PLAN DOES NOT RELIEVE THE CONTRACTOR OF HIS RESPONSIBILITY AS SPECIFIED IN SECTION 901.3 (A) OF PENNSYLVANIA PUBLIC SAFETY.

THE CONTRACTOR IS WARNED THAT THIS PLAN IS NOT INTENDED TO RELIEVE HIM OF THE RESPONSIBILITY FOR THE PROTECTION OF THE PUBLIC AND THE CONSTRUCTION PERSONNEL. THE PWS CONSTRUCTION ZONE STANDARDS ARE MINIMUM AND ADDITIONAL PROTECTION MAY BE NEEDED IF PROBLEMS ARE ENCOUNTERED DURING THE TERM OF THE CONTRACT. CONSTANTLY REVIEW THIS PLAN FOR ACCURACY AND TO RECOMMEND CHANGES FOR PWS REPRESENTATIVE APPROVAL WHEN INADEQUACIES ARE DISCOVERED.

NOTIFY THE PWS REPRESENTATIVE AT LEAST TWO WEEKS PRIOR TO MODIFYING EXISTING TRAFFIC PATTERNS. ALL MODIFICATIONS MUST BE APPROVED BY THE PWS REPRESENTATIVE.

NOTIFY LOCAL SCHOOL DISTRICTS, PHILADELPHIA STREETS DEPARTMENT, PENNSYLVANIA PUBLIC SAFETY AND EMERGENCY SERVICE PROVIDERS A MINIMUM OF TWO WEEKS PRIOR TO IMPLEMENTATION OF A START OF WORK. PROVIDE THE PWS REPRESENTATIVE WITH A LIST OF THE ENTITIES NOTIFIED INCLUDING THE CONTACT PERSON(S) NAME AND POSSIBLE TELEPHONE NUMBER AND THE DATE THE PERSON(S) WERE NOTIFIED.

ALL LONG-TERM CONSTRUCTION SIGNS TO BE FREE STANDING AND MOUNTED ON CITY OR SANITARIAN UNLESS OTHERWISE NOTED.

IMMEDIATELY UPON COMPLETION OF THE WORK, REMOVE TRAFFIC CONTROL SIGNS AND DEVICES FOR ALL TYPES OF MOUNTED TRAFFIC CONTROL SIGNS, FULL ANCHOR POSTS AND RESTORE PAVING AND SIDEWALK.

ALL TRAFFIC CONTROL SIGNS AND DEVICES PLACED MUST BE INSPECTED BY THE PWS REPRESENTATIVE OR HIS REPRESENTATIVE BEFORE WORK BEGINS.

INSTALL AND MAINTAIN THE TEMPORARY SIGNS AND TRAFFIC CONTROL DEVICES AS SPECIFIED ON THE PWS CONSTRUCTION ZONE STANDARDS AND IN ACCORDANCE WITH THE PROVISIONS OF PENNSYLVANIA PUBLIC SAFETY PUBLICATION 212. ALL SIGNS ARE TO BE TYPE OR RETROREFLECTIVE SHEETING CONFORMANCE TO THE DEPARTMENT'S SPECIFICATION. UTILIZE ONLY ALL COLORS AND DIMENSIONS USED FOR TRAFFIC CONTROL SIGNS TYPE A OR TYPE B RETROREFLECTIVE SHEETING.

KEEP DRIVEWAYS ACCESSIBLE AT ALL TIMES. LOCATE ALL SIGNS SO THAT SIGN DISTANCE IS NOT RESTRICTED AT DRIVEWAYS AND SIDE STREETS.

ALL ADVANCE WARNING SIGNS AND CHANNELIZING DEVICES MAY BE ADJUSTED BACK OR (FORWARD) TO INTERSECTING STREETS, DRIVE, ETC. AND/OR AS FIELD CONDITIONS DICTATE.

REMOVE ALL CONFLICTING PAVEMENT MARKINGS (TEMPORARY AND EXISTING) IN A MANNER APPROVED BY THE PWS REPRESENTATIVE AND REPLACE UPON COMPLETION OF THE PROJECT.

PLACE TEMPORARY STOPPING RESTRICTION SIGNS AS NEEDED FOR THE DURATION OF EACH CONSTRUCTION STAGE. CONTACT PHILADELPHIA PARKING AUTHORITY AND PAT O'DONNELL, PHILADELPHIA STREETS DEPARTMENT AT (215)-686-3034 TO COORDINATE PARKING RESTRICTIONS.

COORDINATE THE COVERTING OR REMOVAL OF PARKING METERS AND SIGNS WITH PHILADELPHIA PARKING AUTHORITY.

PLACE TEMPORARY STOP STOP RELOCATION SIGNS AS NEEDED FOR THE DURATION OF EACH CONSTRUCTION STAGE. CONTACT SEPTA AND PAT O'DONNELL, PHILADELPHIA STREETS DEPARTMENT AT (215)-686-3034 TO COORDINATE SEPTA STOP RELOCATION.

CONTACT CITY OF PHILADELPHIA STREETS DEPARTMENT TO COORDINATE WITH LAW RESTRICTIONS.

CONTRACTOR IS RESPONSIBLE FOR COORDINATING CONSTRUCTION ACTIVITIES, CONSTRUCTION SIGNS AND MAINTENANCE AND PROTECTION OF TRAFFIC WITH ALL CONTRACTORS AND SUBCONTRACTORS OF ALL ADJACENT CONSTRUCTION PROJECTS UNDER CONTRACT WITH PWS, PENNSYLVANIA PUBLIC SAFETY OR CITY OF PHILADELPHIA. ALL COSTS ASSOCIATED WITH COORDINATION WILL BE THE RESPONSIBILITY OF THE CONTRACTOR.

CONTRACTOR MUST COORDINATE TRAFFIC CONTROL SIGNS WITH CURRENT CONSTRUCTION OPERATIONS AND ADJUST SIGNING IF FIELD CONDITIONS WARRANT.

SIGHT TRIUM OPERATIONS NOT INDICATED BY THIS PLAN SHALL BE PERFORMED USING THE APPLICABLE PWS FIGURES OF PENNSYLVANIA PUBLIC SAFETY.

THE CONTRACTOR IS RESPONSIBLE FOR THE COVERING, REMOVAL, AND/OR STORAGE OF ALL CONFLICTING SIGNS WITHIN THE PROJECT LIMITS. THESE SIGNS WILL REMAIN THE PROPERTY OF THE OWNER. THE CONTRACTOR IS RESPONSIBLE FOR REINSTALLING THE APPLICABLE SIGNS AT THE END OF THE PROJECT AS DIRECTED BY THE PWS REPRESENTATIVE. ANY SIGNS THAT ARE DAMAGED WILL BE REPLACED BY THE CONTRACTOR.

MAINTAIN ACCESS TO FIRE HYDRANTS DURING CONSTRUCTION.

WORKING HOURS SUBJECT TO MODIFICATIONS AS DIRECTED BY THE PWS REPRESENTATIVE. DAYTIME TRAVEL LANE CLOSURES AND NIGHT WORK ARE LIMITED TO CITY OF PHILADELPHIA ORDINANCES.

WHENEVER THE ROADWAY IS OPENED TO TRAFFIC PRIOR TO THE COMPLETION OF THE OVERLAY APPLICATION, AS MAY BE ALLOWED OR DIRECTED BY THE PWS REPRESENTATIVE, ACCOMPLISH PROPER TRANSITION BETWEEN THE SURFACE DIFFERENTIALS BEFORE THE TRAFFIC IS ROLED ONTO THE INCOMPLETE LANE.


PWS CONSTRUCTION ZONE STANDARDS SHOULD BE USED ON ROADS CLASSIFIED AS LOCAL WORK OR STATE ROUTES REQUIRE A PROJECT SPECIFIC MAINTENANCE AND PROTECTION OF TRAFFIC PLAN.

CONFIRM ROADWAY CLASSIFICATION AS DEFINED BY PHILADELPHIA STREETS DEPARTMENT.

CONSTRUCTION DETAILS OTHER THAN THOSE SHOWN ON THESE DRAWINGS TO CONFORM TO THE FOLLOWING STANDARD DRAWINGS:

RC-10M	JUNE 1, 2010	TC-8500	JUNE 13, 2010
RC-13M	JUNE 1, 2010	TC-8700C	JUNE 13, 2010
RC-14M	JUNE 1, 2010	TC-8700B	JUNE 13, 2010
RC-80M	JUNE 1, 2010	TC-8717	JUNE 13, 2010
RC-67M	JUN 1, 2010	TC-8801	DEC 13, 2011
RC-12M	JUN 1, 2010	TC-8802	DEC 13, 2011
RC-12M	JUN 1, 2010	TC-8803	DEC 13, 2011
RC-12M	JUN 1, 2010	TC-8804	DEC 13, 2011
RC-12M	JUN 1, 2010	TC-8805	DEC 13, 2011
		TC-8806	DEC 13, 2011

**DRAFT**



EST. 1801

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**PROJECT NAME:** \_\_\_\_\_

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**STREET/BLOCK:** \_\_\_\_\_

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**PWS CONSTRUCTION ZONE STANDARDS  
GENERAL NOTES**

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DATE: JUNE 2010		1 SHEET OF 10
SCALE: N/A		
DRAWN BY:		
DESIGN BY:		
CHECKED BY:		

**PEDESTRIAN FACILITIES**

STAKE CONSTRUCTION TO MAINTAIN PEDESTRIAN WALKWAYS THROUGH WORK ZONES OR PROVIDE PEDESTRIAN DIVERSION.

IF SIDEWALKS MUST BE CLOSED, REFER TO PENNSYLVANIA PUBLICATION 213 (ADA REQUIREMENTS 108, 128, AND 130).

MAINTAIN ACCESS TO ALL BUILDING ENTRANCES AND DRIVEWAYS. MAINTAIN ACCESS TO ALL BUS STOPS. COORDINATE WITH DEP'S FOR TEMPORARY BUS STOP RELOCATION.

PEDESTRIAN WALKWAYS MUST BE A MINIMUM OF 4-FT IN WIDTH. PROVIDE MINIMUM 5-FT WIDTH WHEREVER FEASIBLE. EVERY 200-FT A 5-FT WIDE & 5-FT LONG PASSING ZONE MUST BE PROVIDED UNLESS A 5-FT WIDE WALKWAY CAN BE PROVIDED THROUGHOUT THE WHOLE LENGTH.

ADA COMPLIANT: WALKWAYS MUST HAVE A MAXIMUM CROSS-SLOPE OF 2% AND A MAXIMUM GRADE OF 5:100 (12:1) INCLUDING RAMP ASKS TO ROADWAYS.

WALKWAYS SURFACES MUST BE STABLE AND SLIP RESISTANT. INLET GRATES AND UTILITY CASTING ARE NOT PERMITTED IN THE WALKWAYS AND CROSSWALKS, BUT MAY BE COVERED WITH A SUITABLE MATERIAL MEETING AMERICANS WITH DISABILITIES ACT (ADA) REQUIREMENTS.

MAINTAIN IN PLACE PEDESTRIAN FACILITIES UNTIL UPDOWNG MODIFIED PEDESTRIAN MATTERS.

WHEN PEDESTRIANS ARE ADJACENT TO ONGOING CONSTRUCTION OR WITHIN 4-FT OF A TRAVEL LANE, PROVIDE A 4-FT FENCE BARRIER MADE OF PLASTIC OR METAL. USE METAL FENCE FOR DROPT OFFS GREATER THAN 2 FEET OR AS DIRECTED BY THE PHO REPRESENTATIVE.

THE PEDESTRIAN BARRIERS SHALL BE CONTINUOUS, STABLE AND NON-FLEXIBLE WITH A DETECTABLE, CONTINUOUS BOTTOM EDGE 8 INCHES ABOVE THE WALKWAY SURFACE. THE PEDESTRIAN BARRIER SHALL ALSO PROVIDE A CONTINUOUS SURFACE OR UPPER RAIL AT A 2" MINIMUM HEIGHT ABOVE THE WALKWAY SURFACE. THE PHO REPRESENTATIVE MUST APPROVE THE FENCE BARRIER DESIGN PRIOR TO INSTALLATION.

IF CONSTRUCTION MATERIALS ARE LIFTED OVER ACTIVE PEDESTRIAN FACILITIES, FRESH OVERHEAD PROTECTION APPROVED BY THE PHO REPRESENTATIVE MUST BE IN PLACE.

NOTHING SHALL BE PERMITTED TO PROTRUDE INTO THE PEDESTRIAN WALKWAY.

CONTRACTOR SHALL COORDINATE ALL ACTIVITIES WITH PHO, THE CITY OF PHILADELPHIA AND PENNSYLVANIA DISTRICT 3 ON STATE ROUTES.

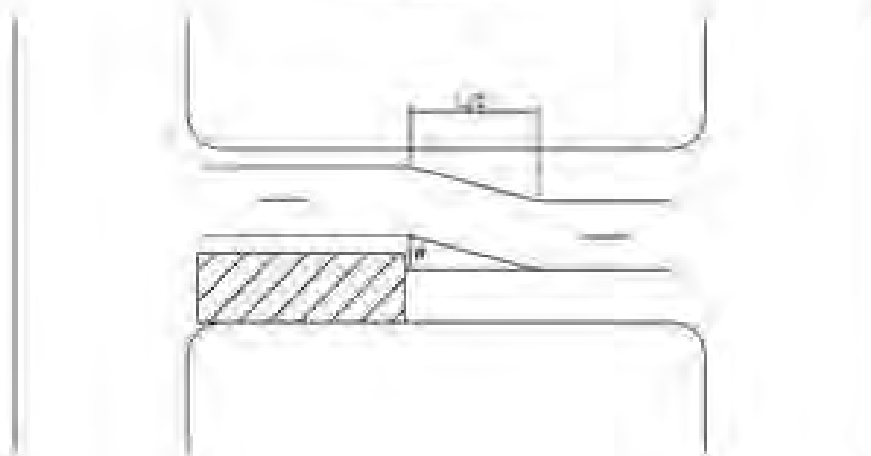
WALKWAY QUICK REFERENCE CHART

SPEED LIMIT (MPH)	W	L	L/2
25	12	12	12
30	12	12	12
35	12	12	12
40	12	12	12
45	12	12	12

TAPER CALCULATIONS

- W = SPEED/40 (TOP SPEED) (MPH) x 40 MPH (MPH)
- W = WIDTH
- L = SPEED LIMIT
- L = 80% (TOP SPEED) (MPH) x 40 MPH (MPH)
- W = WIDTH
- L = SPEED LIMIT

TAPER LENGTH



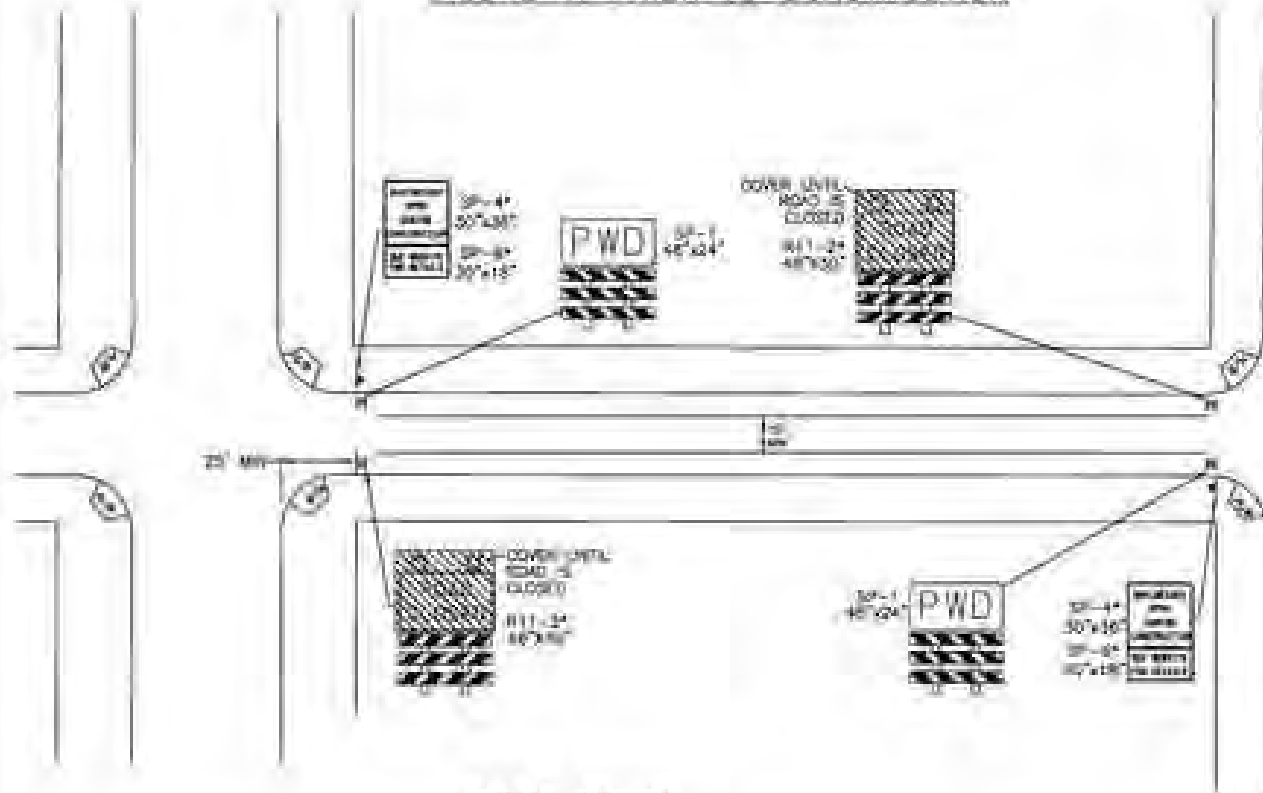
**DRAFT**



PROJECT NAME:	
STREET/BLOCK:	
PHO CONSTRUCTION ZONE STANDARDS GENERAL NOTES - PEDESTRIANS	
DATE: JUNE 2018	2
SCALE: N/A	
DRAWN BY:	
DESIGN BY:	
CHECKED BY:	SHEET 3 OF 15

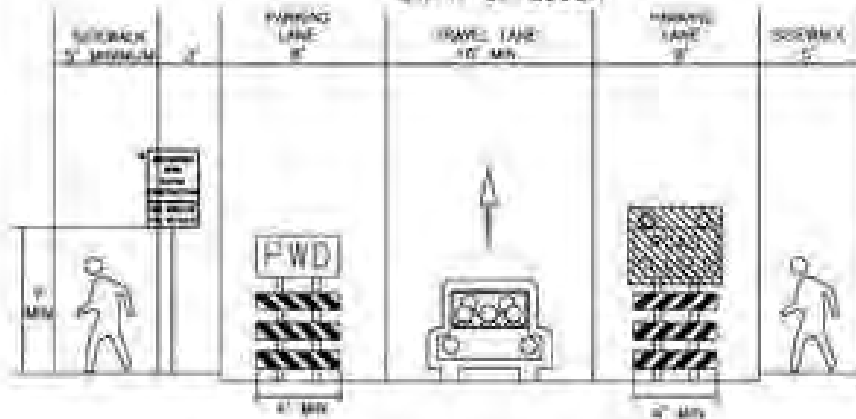
FIGURE 1: PRIOR TO CONSTRUCTION

- NOTES:
1. PLACE SIGNS AT START OF EXISTING PARKING LANES WITH MINIMUM IMPACT TO PARKING LANE.
  2. PLACE BUSINESS OPEN DURING CONSTRUCTION SIGNS ON SIDEWALK OUT OF THE PEDESTRIAN PATH.
  3. INSTALL SIGN SP-4 WHEN BUSINESSES ARE PRESENT ON THE BLOCK UNDER CONSTRUCTION.
  4. STATE ROUTES REQUIRE PROJECT SPECIFIC MPT PLAN.
- END NOTES



DRAFT

TYPICAL SECTION START OF BLOCK

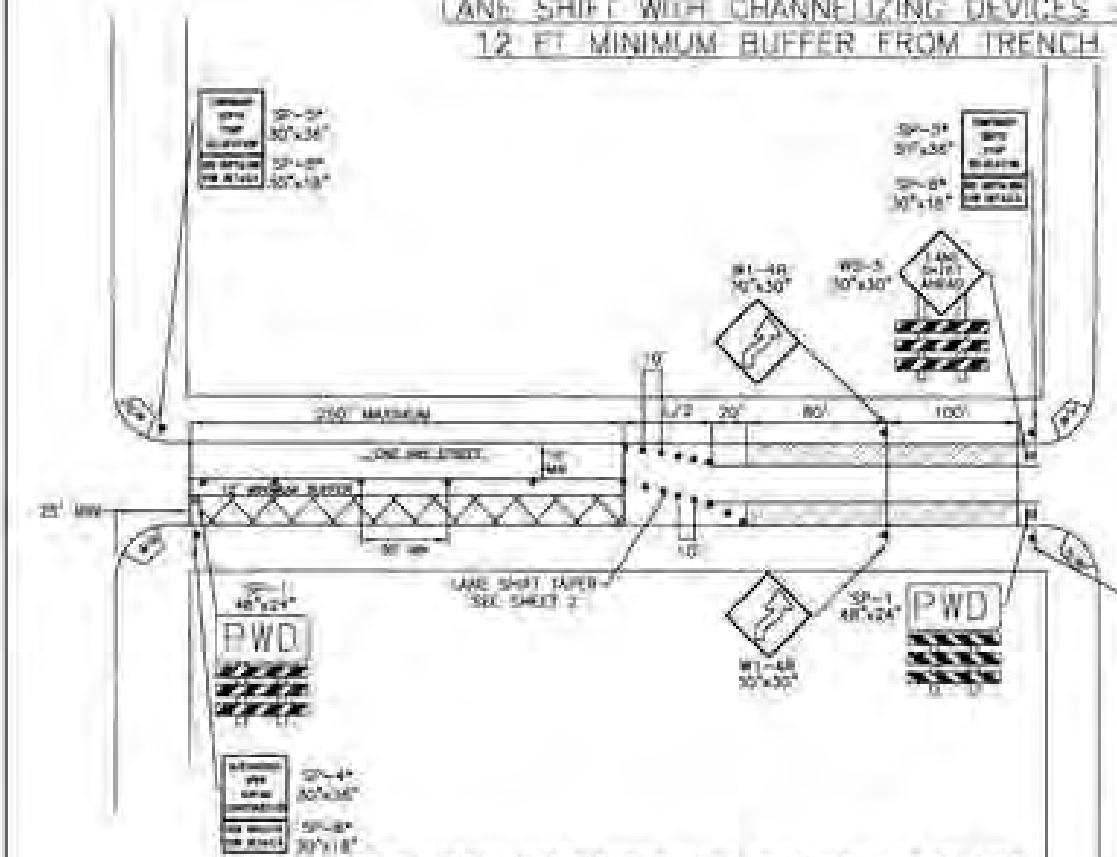


- LEGEND
- ▨ TYPE 3 BARRIAGE
  - ▲ SIGN POST

<b>PHILADELPHIA WATER</b> EST. 1861	
PROJECT NAME:	
STREET/BLOCK:	
PWD CONSTRUCTION ZONE STANDARDS FIGURE 1: PRIOR TO CONSTRUCTION	
DATE: JUNE 2018	3
SCALE: N/A	
DRAWN BY:	
DESIGNED BY:	
CHECKED BY:	SHEET 2 OF 10

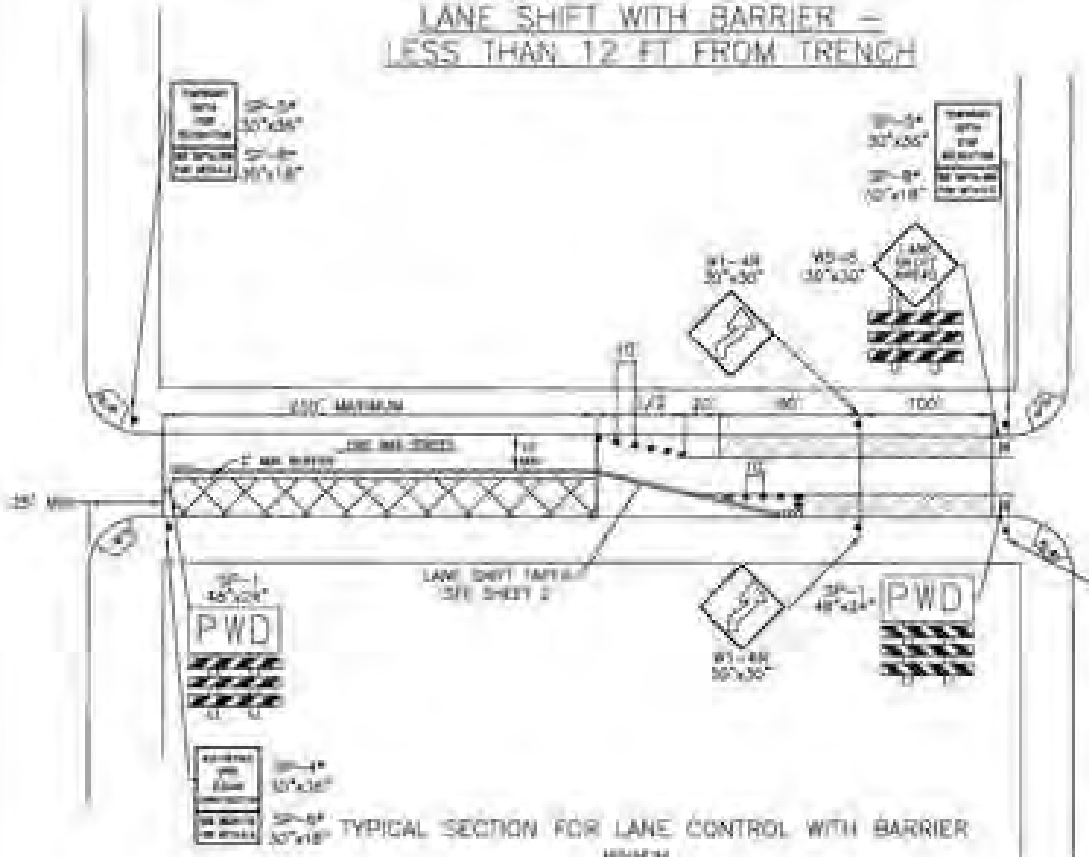
NOT TO SCALE

**FIGURE 2A: CONSTRUCTION ZONE SIGNS  
ONE-WAY STREET  
LANE SHIFT WITH CHANNELIZING DEVICES -  
12 FT MINIMUM BUFFER FROM TRENCH**

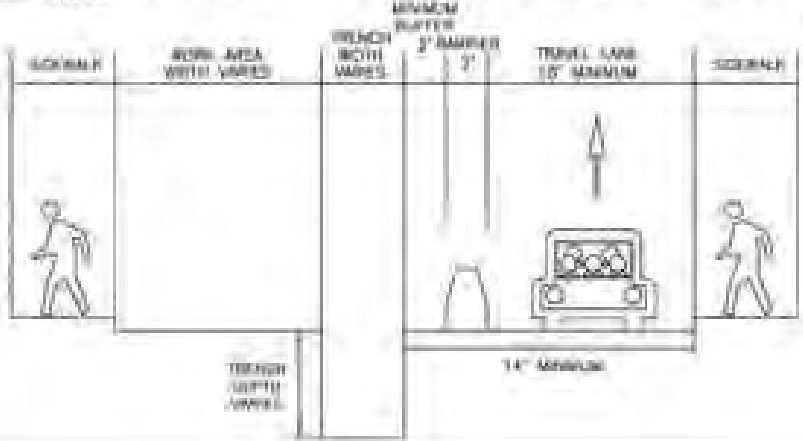


**FIGURE 2B: CONSTRUCTION ZONE SIGNS**  
**ONE-WAY STREET**  
**LANE SHIFT WITH BARRIER =**  
**LESS THAN 12 FT FROM TRENCH**

- NOTES:**
1. PLACE SIGNS AT START OF EXISTING PARKING LANES WITH MAXIMUM IMPACT TO PARKING LANE.
  2. PLACE SIGNS ON SIDEWALK OUT OF THE PEDESTRIAN PATH.
  3. INSTALL SIGN 81-48 WHEN BUSINESSES ARE PRESENT ON THE BLOCK UNDER CONSTRUCTION.
  4. INSTALL SIGN 81-48 WHEN SEPTA STOP RELOCATION IS ON THIS BLOCK.
  5. TYPICAL WORKING HOURS 7AM-4PM.
  6. COORDINATE TEMPORARY NO PARKING ZONES WITH PHILADELPHIA PARKING AUTHORITY AS NEEDED.
  7. COORDINATE SEPTA STOP RELOCATION WITH SEPTA AS NEEDED.
  8. BARRIER MAY BE USED IF 14 FEET ARE AVAILABLE BETWEEN THE EDGE OF CURB AND THE EDGE OF TRENCH.
  9. GUIDANCE DEPENDS ON SITE CONDITIONS.
  10. SOME ROUTES REQUIRE PROJECT SPECIFIC MUT PLAN.



**TYPICAL SECTION FOR LANE CONTROL WITH BARRIER**



**PHILADELPHIA WATER**  
EST. 1861

PROJECT NAME: \_\_\_\_\_  
 STREET/BLOCK: \_\_\_\_\_

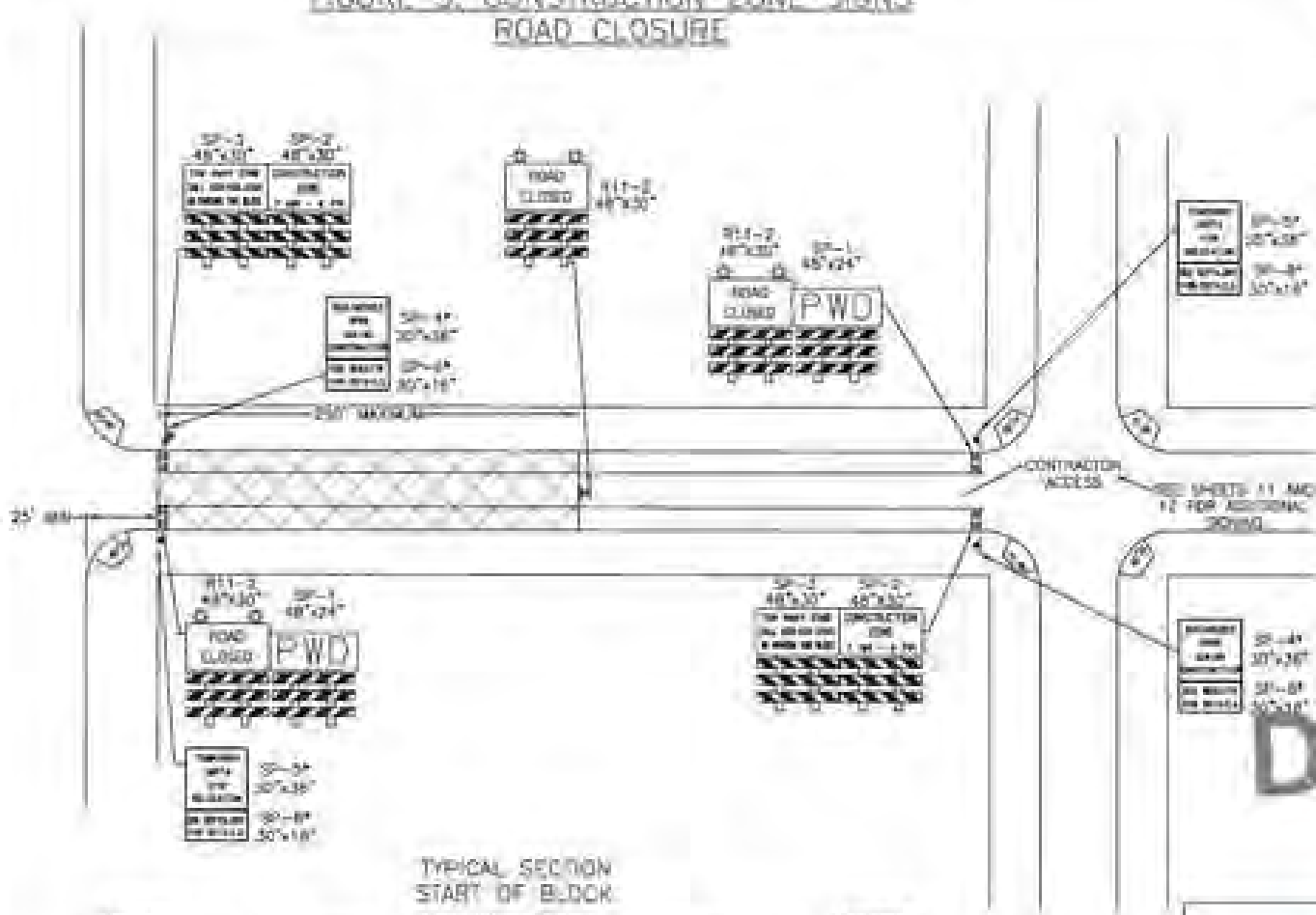
FWD CONSTRUCTION ZONE STANDARDS  
 FIGURE 2B: ONE-WAY STREET  
 LANE SHIFT WITH BARRIER =  
 LESS THAN 12 FT FROM TRENCH

DATE: JUNE 2015  
 SCALE: NTS  
 DRAWN BY: \_\_\_\_\_  
 CHECKED BY: \_\_\_\_\_

5  
 SHEET 5 OF 15

**FIGURE 3: CONSTRUCTION ZONE SIGNS  
ROAD CLOSURE**

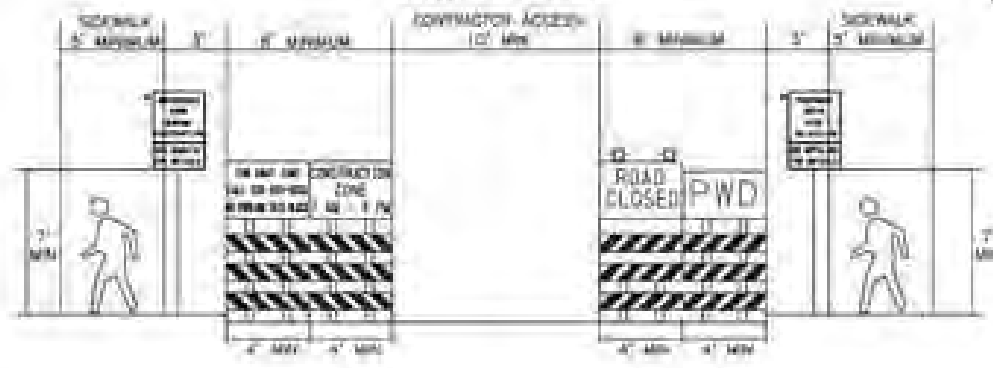
- NOTES:**
1. PLACE SIGNS ON SIDEWALK OUT OF THE PEDESTRIAN PATH.
  2. INSTALL SIGN SP-4 WHEN BUSINESSES ARE PRESENT ON THE BLOCK UNDER CONSTRUCTION.
  3. INSTALL SIGN SP-3 WHEN SEPTA STOP RELOCATION IS ON THIS BLOCK.
  4. TYPICAL WORKING HOURS (7AM-4PM).
  5. COORDINATE TEMPORARY NO PARKING SIGNS WITH PHILADELPHIA PARKING AUTHORITY AS NEEDED.
  6. COORDINATE SEPTA STOP RELOCATION WITH SEPTA AS NEEDED.
  7. SEE SHEETS 11 AND 12 FOR ADDITIONAL SIGNS.
  8. STATE WORKING BUSINESS PROJECT (SICR): NPT PLAN.
  9. N/C NEEDED.



**DRAFT**

- LEGEND:**
- [Hatched Box] ACTIVE ROAD WITH AWWA
  - [Diagonal Lines Box] TYPE B BARRICADE
  - [Triangle] SIGN POST

**TYPICAL SECTION  
START OF BLOCK**



<b>PHILADELPHIA WATER</b> EST. 1801	
PROJECT NAME:	
STREET/BLOCK:	
P.W.D. CONSTRUCTION ZONE STANDARDS FIGURE 3: ROAD CLOSURE	
DATE: JUNE 2016	6
SCALE: N/T/S	
DRAWN BY:	
DESIGN BY:	
CHECKED BY:	SHEET 6 OF 15

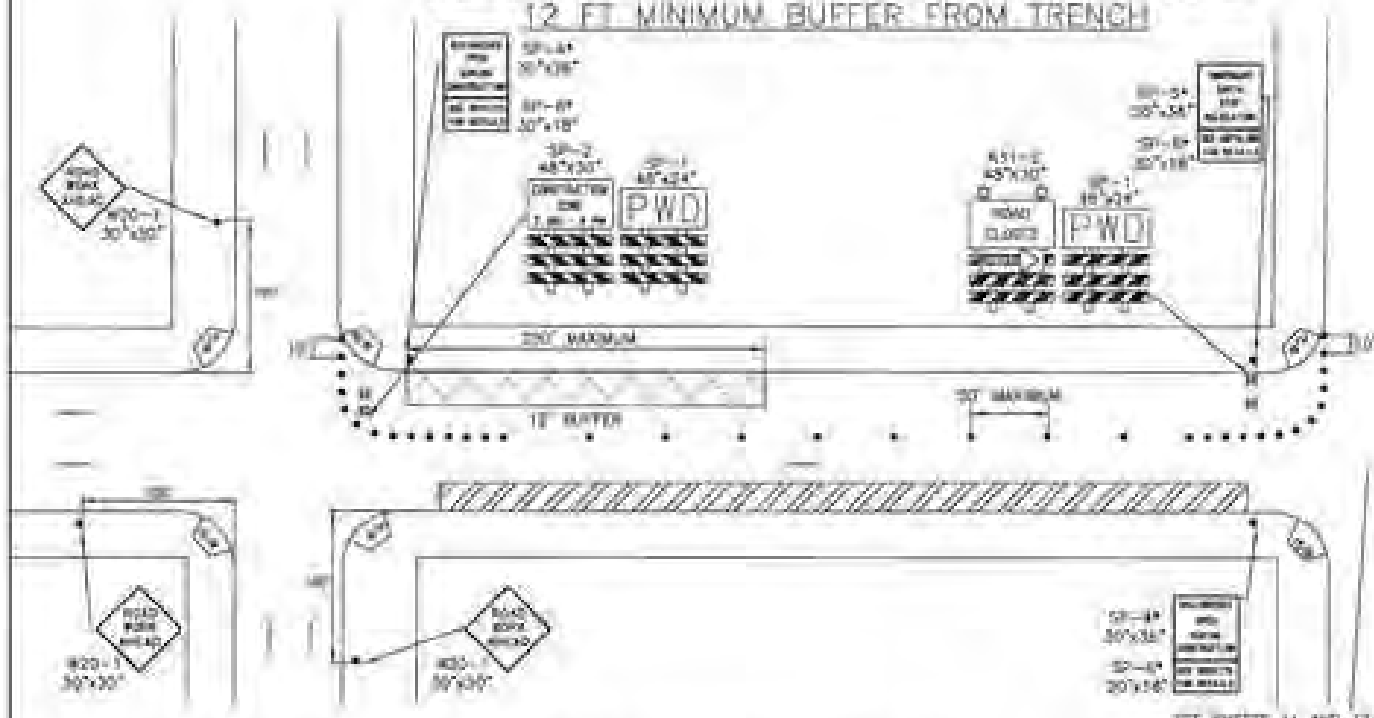
NOT TO SCALE



FIGURE 4A: CONSTRUCTION ZONE SIGNS

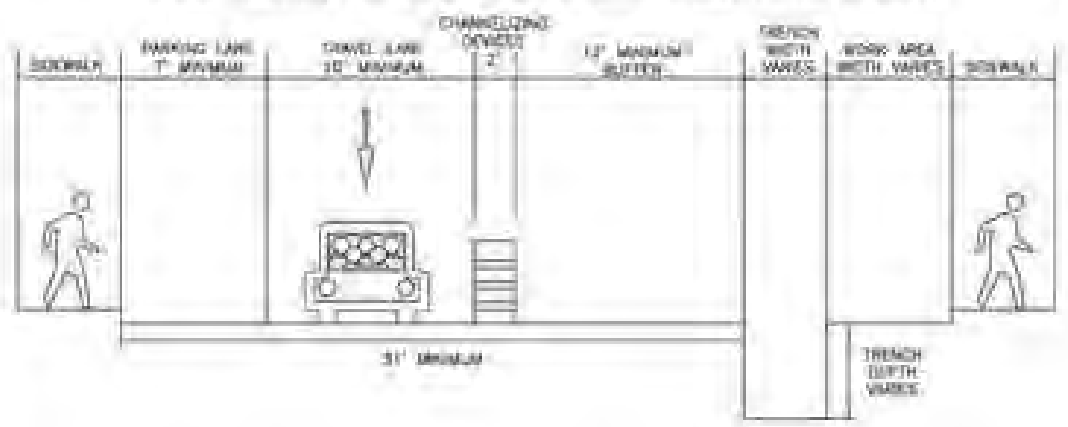
TWO-WAY STREET

ONE WAY CLOSURE WITH CHANNELIZING DEVICES -  
12 FT MINIMUM BUFFER FROM TRENCH



- NOTES:
1. PLACE SIGNS AT START OF EXISTING PARKING LANES WITH MINIMUM IMPACT TO PARKING LANE.
  2. PLACE SIGNS ON SIDEWALK OUT OF THE PEDESTRIAN PATH.
  3. INSTALL SIGN W20-4 WHEN BUSINESSES ARE PRESENT ON THE BLOCK UNDER CONSTRUCTION.
  4. INSTALL SIGN W20-5 WHEN SUPPLEMENTAL STOP RELOCATION IS ON THIS BLOCK.
  5. TYPICAL WORKING HOURS 7AM-6PM.
  6. COORDINATE TEMPORARY NO PARKING SIGNS WITH PHILADELPHIA PARKING AUTHORITY AS NEEDED.
  7. COORDINATE SUPPLEMENTAL STOP RELOCATION WITH SUPRA AS NEEDED.
  8. SEE SHEETS 11 AND 12 FOR ADDITIONAL DETOUR STORAGE.
  9. CHANNELIZING DEVICES MAY BE USED IF 24 FEET ARE AVAILABLE BETWEEN THE EDGE OF CURB AND THE EDGE OF TRENCH.
  10. SURFACE DEPENDS ON SITE CONDITIONS.
  11. STATE ROUTES REQUIRE PROJECT SPECIFIC MPT **PLACEMENT LOGS**.

TYPICAL SECTION FOR LANE CONTROL WITH CHANNELIZING DEVICES



**DRAFT**

SEE SHEETS 11 AND 12 FOR ADDITIONAL DETOUR STORAGE.

NO NEEDED  
 ROAD WORK AREA  
 PARKING AREA  
 12 FT B BARRICADE  
 SIGN POST  
 CHANNELIZING DEVICE

**PHILADELPHIA WATER**  
EST. 1891

PROJECT NAME: \_\_\_\_\_

STREET/BLOCK: \_\_\_\_\_

PWD CONSTRUCTION ZONE STANDARDS  
FIGURE 4A: TWO-WAY STREET  
ONE WAY CLOSURE WITH CHANNELIZING DEVICES -  
12 FT MINIMUM BUFFER FROM TRENCH

DATE: JUNE 2018  
SCALE: NTS  
DRAWN BY: \_\_\_\_\_  
DESIGN BY: \_\_\_\_\_  
CHECKED BY: \_\_\_\_\_

7

SHEET 7 OF 15

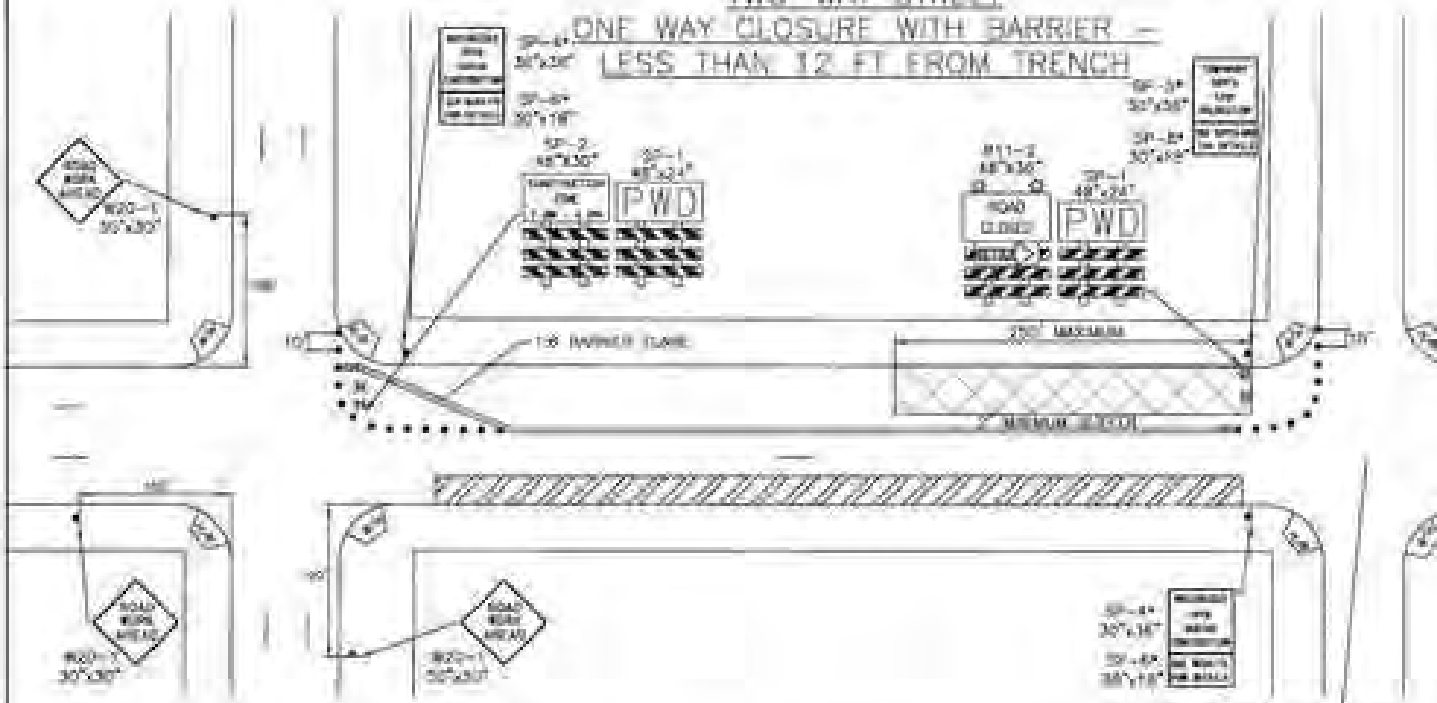
NOT TO SCALE

FIGURE 4B: CONSTRUCTION ZONE SIGNS

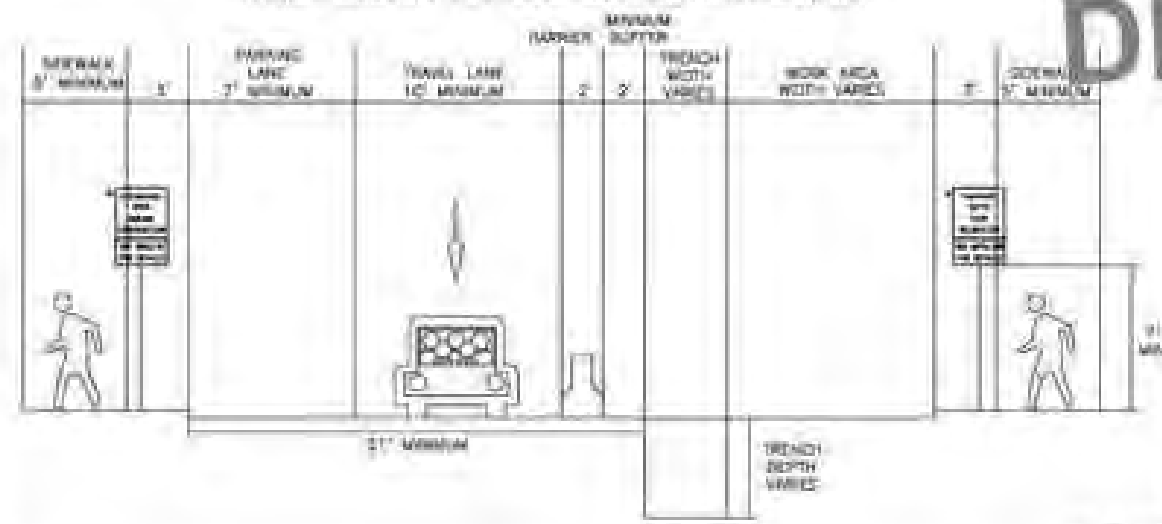
TWO-WAY STREET

ONE WAY CLOSURE WITH BARRIER - LESS THAN 12 FT FROM TRENCH

- NOTES:
1. PLACE SIGNS AT START OF EXISTING PARKING LANE WITH MINIMUM IMPACT TO PARKING LANE.
  2. PLACE SIGNS ON SIDEWALK OUT OF THE PEDESTRIAN PATH.
  3. INSTALL SIGN SP-8 WHEN SLOWDOWN AHEAD PRESENT ON THE BLOCK UNDER CONSTRUCTION.
  4. INSTALL SIGN SP-5 WHEN SOFTA STOP RELOCATION IS ON THE BLOCK.
  5. TYPICAL WORKING HOURS 7AM-4PM.
  6. COORDINATE TEMPORARY HO PARKING SIGNS WITH PHILADELPHIA PARKING AUTHORITY AS NEEDED.
  7. COORDINATE SOFTA STOP RELOCATION WITH SOFTA AS NEEDED.
  8. SEE SHEETS 11 AND 12 FOR ADDITIONAL DETOUR STORAGE.
  9. BARRIER MAY BE USED IF 21 FEET ARE AVAILABLE BETWEEN THE EDGE OF CURB AND THE EDGE OF TRENCH.
  10. CLEARANCE DEPENDS ON SITE CONDITIONS.
  11. STATE ROUTES REQUIRE PROJECT SIGNING WITH TRAILS.



TYPICAL SECTION FOR LANE CONTROL WITH BARRIER



**DRAFT**

- LEGEND:
- ROAD WORK AREA
  - PARKING AREA
  - TYPE 'A' BARRIAGE
  - SOFT STOP
  - BARRIER
  - ATTENUATOR
  - CHANNELIZING DEVICE

PHILADELPHIA WATER 2011 1001

PROJECT NAME: \_\_\_\_\_

STREET/BLOCK: \_\_\_\_\_

PWD CONSTRUCTION ZONE STANDARDS  
FIGURE 4B: TWO-WAY STREET  
ONE WAY CLOSURE WITH BARRIER -  
LESS THAN 12 FT FROM TRENCH

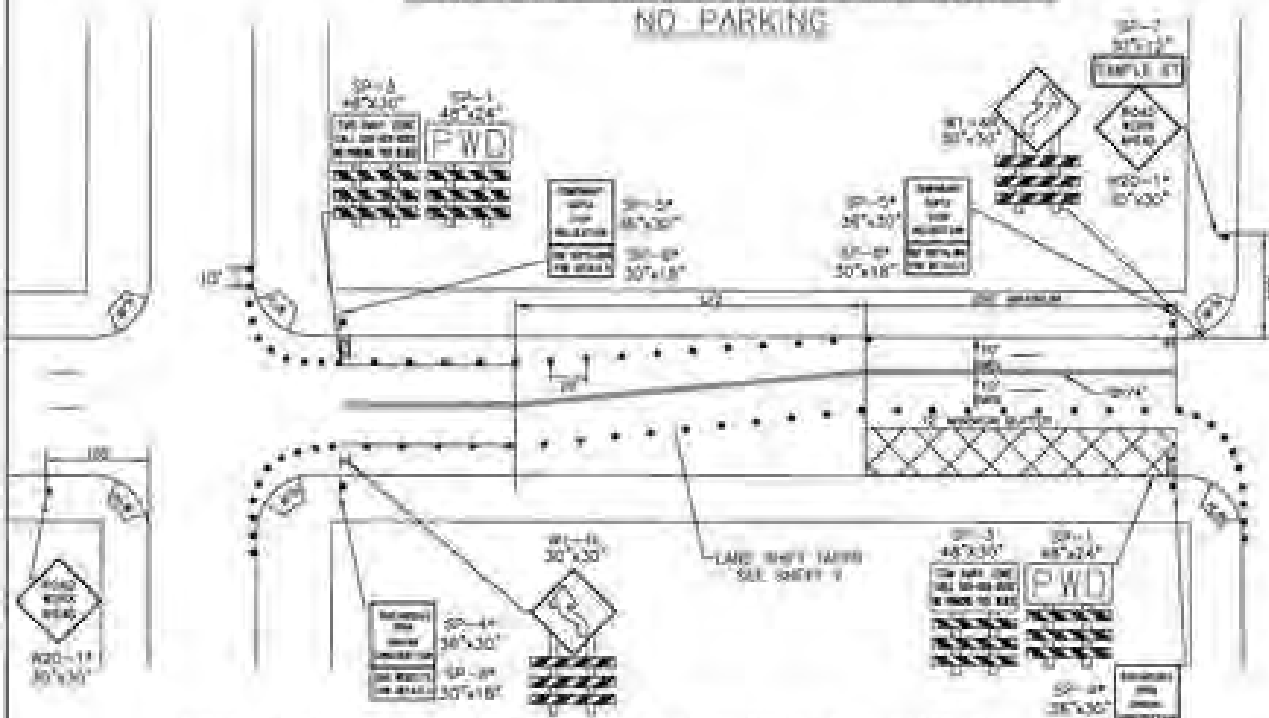
DATE: JUNE 2018  
SCALE: 1/8"=1'-0"  
DRAWN BY: \_\_\_\_\_  
DESIGN BY: \_\_\_\_\_  
CHECKED BY: \_\_\_\_\_

8

Sheet 8 of 13

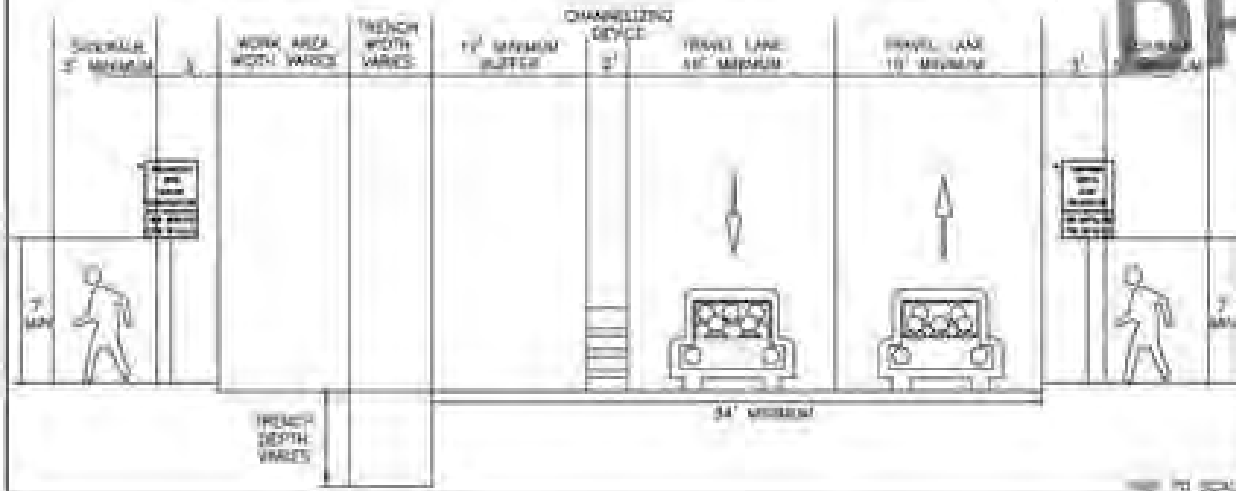
NOT TO SCALE

**FIGURE 5A: CONSTRUCTION ZONE SIGNS  
TWO-WAY STREET  
LANE SHIFT WITH CHANNELIZING DEVICES  
NO PARKING**



- NOTES:**
1. PLACE SIGNS AT START OF EXISTING PARKING LANE(S) WITH MINIMAL IMPACT TO PARKING LANE.
  2. PLACE SIGNS ON SIDEWALK OUT OF THE PEDESTRIAN PATH.
  3. INSTALL SIGN W20-4 WHEN BUSINESSES ARE PRESENT ON THE BLOCK UNDER CONSTRUCTION.
  4. INSTALL SIGN W20-5 WHEN SEPTA STOP RELOCATOR IS ON THE BLOCK.
  5. TYPICAL WORKING WIDTH: 24M-47M.
  6. COORDINATE TEMPORARY NO PARKING SIGNS WITH PHILADELPHIA PARKING AUTHORITY AS NEEDED.
  7. EMPLOYER SEPTA STOP RELOCATOR WITH SEPTA AS NEEDED.
  8. CHANNELIZING DEVICES MAY BE USED IF 34 FEET ARE AVAILABLE BETWEEN THE EDGE OF CURB AND THE EDGE OF TRENCH.
  9. GUIDANCE DEPENDS ON SITE CONDITIONS.
  10. STATE-RELATED REQUIREMENTS SPECIFIC APT PLANS.

TYPICAL SECTION FOR LANE CONTROL WITH CHANNELIZING DEVICES



**DRAFT**

- LEGEND:**
- ROAD WORK AREA
  - PARKING AREA
  - TYPE B BARRICADE
  - SEPTA STOP
  - BARRIER
  - ATTENUATOR
  - CHANNELIZING DEVICE
  - TEMPORARY DOUBLE YELLOW WITH

**PHILADELPHIA WATER**  
EST. 1841

PROJECT NAME: \_\_\_\_\_

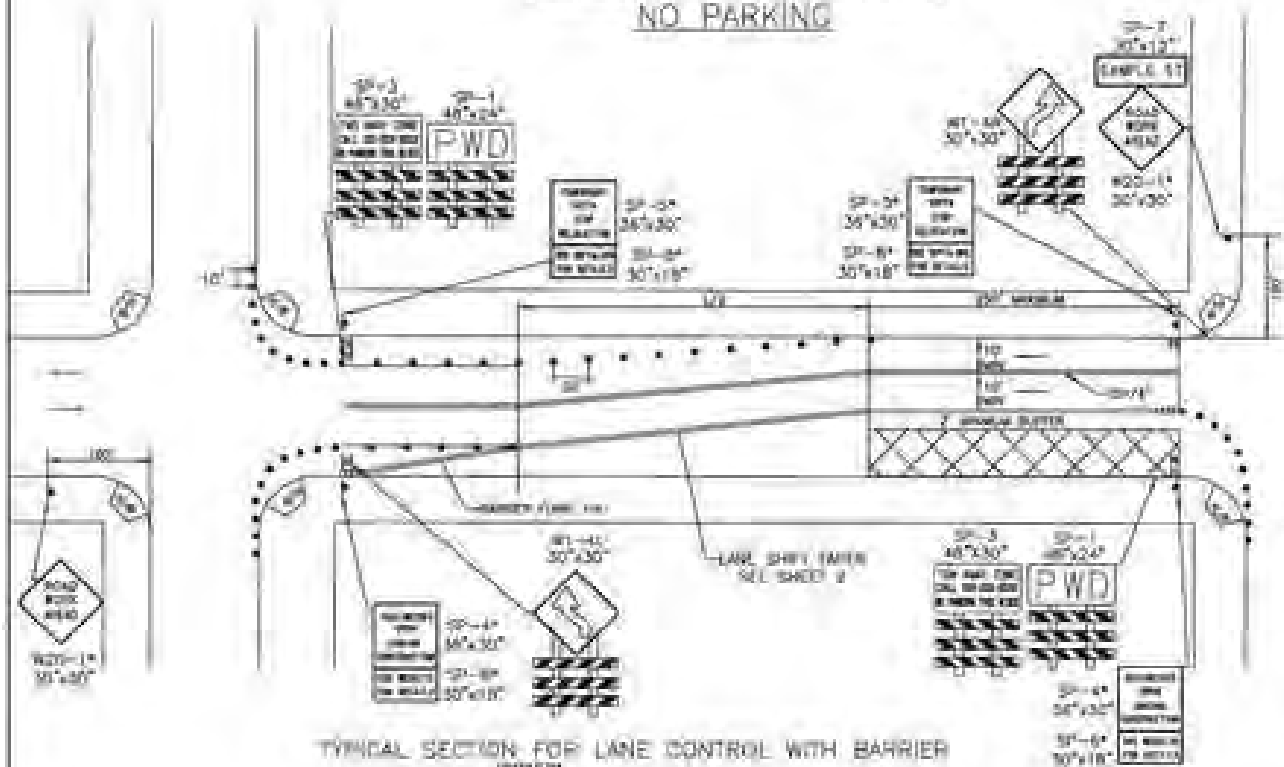
STREET/BLOCK: \_\_\_\_\_

PWD CONSTRUCTION ZONE STANDARDS  
FIGURE 5A: TWO-WAY STREET  
LANE SHIFT WITH CHANNELIZING DEVICES  
NO PARKING

DATE: JUNE 2018  
SCALE: N/T  
DRAWN BY: \_\_\_\_\_  
CHECKED BY: \_\_\_\_\_

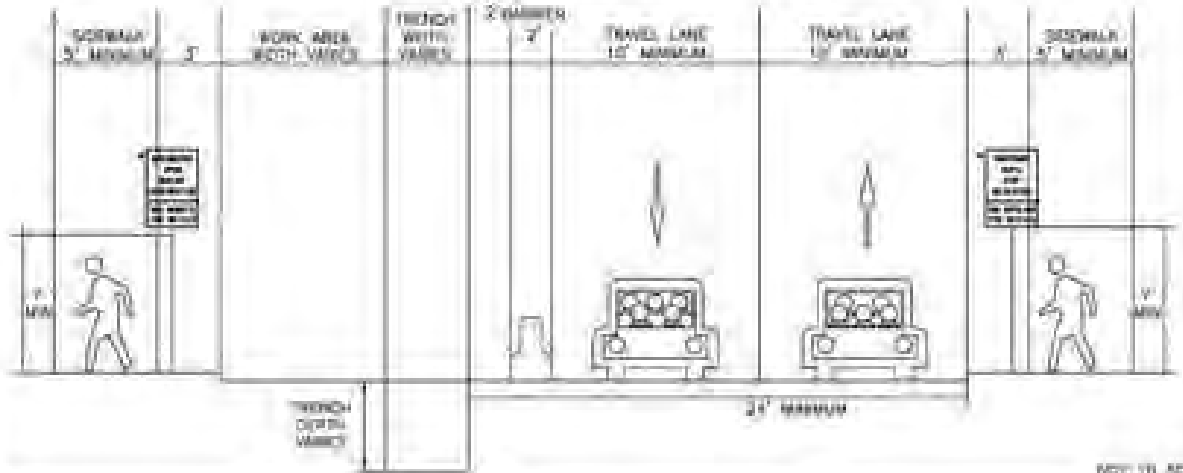
9  
SHEET 9 OF 15

**FIGURE 5B: CONSTRUCTION ZONE SIGNS**  
**TWO-WAY STREET**  
**LANE SHIFT WITH BARRIER**  
**NO PARKING**



- NOTES:**
1. PLACE SIGNS AT START OF EXISTING PARKING LANES WITH MINIMUM IMPACT TO PARKING LANE.
  2. PLACE SIGNS ON SIDEWALK OUT OF THE PEDESTRIAN PATH.
  3. INSTALL SIGN SP-4 WHEN BUSINESSES ARE PRESENT ON THE BLOCK UNDER CONSTRUCTION.
  4. INSTALL SIGN SP-5 WHEN SEPTA STOP RELOCATION IS ON THIS BLOCK.
  5. TYPICAL WORKING HOURS: 7AM-4PM.
  6. COORDINATE TEMPORARY NO PARKING SIGNS WITH PHILADELPHIA PARKING AUTHORITY AS NEEDED.
  7. COORDINATE SEPTA STOP RELOCATION WITH SEPTA AS NEEDED.
  8. BARRIER MAY BE USED IF 24 FEET ARE AVAILABLE BETWEEN THE EDGE OF CURB AND EDGE OF TRENCH.
  9. GUIDANCE DEPENDS ON SITE CONDITIONS.
  10. STATE ROUTES REQUIRE PROJECT SPECIFIC MUT PLANS.
- LEGEND:**
- ROAD WORK AREA
  - PARKING AREA
  - TYPE II BARRIER

**TYPICAL SECTION FOR LANE CONTROL WITH BARRIER**



**DRAFT**

PHILADELPHIA WATER  
 10/14/18 TEMPORARY DECORATIVE YELLOW / WITH

PHILADELPHIA WATER  
 EST. 1961

PROJECT NAME: \_\_\_\_\_

STREET/BLOCK: \_\_\_\_\_

PWD CONSTRUCTION SIGN STANDARDS  
 FIGURE 5B: TWO-WAY STREET  
 LANE SHIFT WITH BARRIER  
 NO PARKING

DATE: JUNE 2018  
 SCALE: N/A  
 DRAWN BY: \_\_\_\_\_  
 DESIGN BY: \_\_\_\_\_  
 CHECKED BY: \_\_\_\_\_

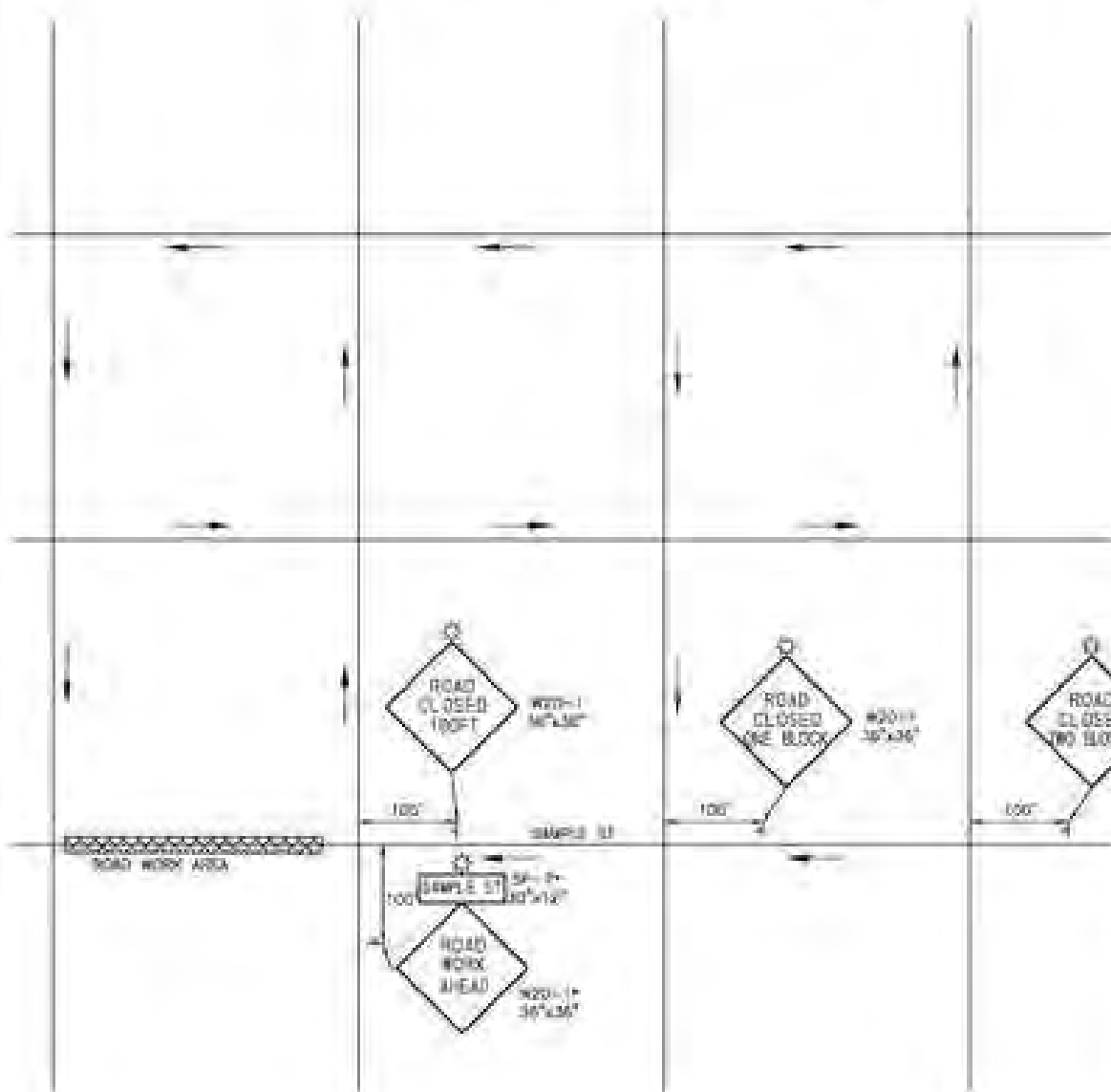
10

SHEET 12 OF 15

**FIGURE 6: ADVANCED WARNING SIGNS**  
**STREET TYPE: LOCAL ONE-WAY**  
**ROAD CLOSURE**

**NOTES:**

1. ADDITIONAL SIGNS MAY BE NEEDED DEPENDING ON SITE CONDITIONS.
  2. SEE FIGURES 1-5 FOR ADDITIONAL SPACE.
  3. IF ROAD IS TWO-WAY, PROVIDE SIGNS IN BOTH DIRECTIONS.
  4. FWD CONSTRUCTION ZONE STANDARDS TO BE USED ON LOCAL ROADS ONLY.
- NOCA NOT REQUIRED @ INTERSECTION IF STOP CONTROLLED



**DRAFT**

**LEGEND:**

- ROAD WORK AREA
- TEMPORARY SIGN PANEL
- LIGHT

FOR TWO-WAY STREET SEE NOTE 3



PROJECT NAME: \_\_\_\_\_

STREET/BLOCK: \_\_\_\_\_

FWD CONSTRUCTION ZONE STANDARDS  
 FIGURE 6: ADVANCED WARNING SIGNS  
 STREET TYPE: LOCAL ONE-WAY  
 ROAD CLOSURE

DATE: JUNE 2018  
 SCALE: NTS  
 DRAWN BY:  
 DESIGN BY:  
 CHECKED BY:

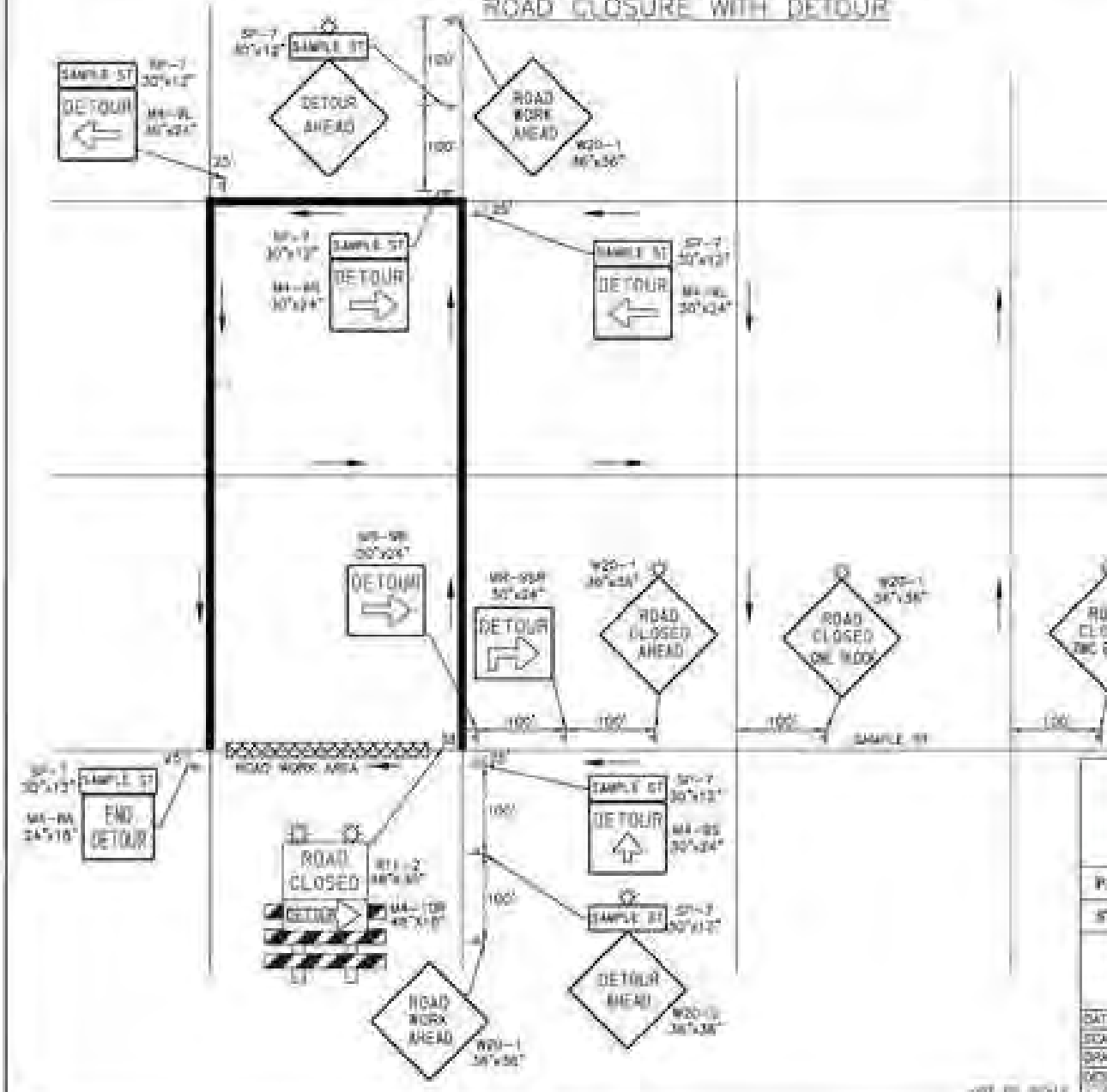
11  
 SHEET 11 OF 14

NOT TO SCALE

FIGURE 7: ADVANCED WARNING AND DETOUR SIGNS  
 STREET TYPE: SECONDARY, ONE-WAY  
 ROAD CLOSURE WITH DETOUR

- NOTES:**
1. ADDITIONAL SIGNS MAY BE REQUIRED DEPENDING ON SITE CONDITIONS.
  2. SEE FIGURES 1-3 FOR ADDITIONAL SIGNAGE.
  3. IF ROAD IS TWO-WAY, PROVIDE SIGNS IN EACH DIRECTION.
  4. PWD CONSTRUCTION ZONE STANDARDS (X) BE USED ON LOCAL ROADS ONLY.
- ADDITIONAL SIGNS AND APPROVALS MAY BE REQUIRED FOR STATE ROUTES.

**DRAFT**



- LEGEND:**
- ROAD WORK AREA
  - DETOUR ROUTE
  - TEMPORARY SIGN POST
  - TYPE II BARRICADE
  - Loop

FOR TWO-WAY STREET SEE NOTE 3

**PHILADELPHIA WATER**  
 2017 2021

PROJECT NAME: \_\_\_\_\_

STREET/BLOCK: \_\_\_\_\_

PWD CONSTRUCTION ZONE STANDARDS  
 FIGURE 7: ADVANCED WARNING AND DETOUR SIGNS  
 STREET TYPE: SECONDARY ONE-WAY STREET  
 ROAD CLOSURE WITH DETOUR

DATE: JUNE 2018  
 SCALE: N/A  
 DRAWN BY:  
 CHECKED BY:  
 DESIGNED BY:

12

SHEET 13 OF 13

1/8" = 1' SCALE

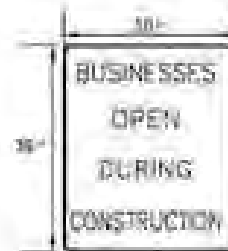
## SIGN DETAILS



**SIGN SP-1**

FWD CONSTRUCTION ENTRANCE SIGN  
FWD TO PROVIDE FOR. SEE PM FOR SIGN DETAILS.

SIGN TO BE MOUNTED ON FWD CONCRETE SIGN BASE. SEE SHEETS 15 AND 16 FOR DETAILS.



**SIGN SP-2**

BACKGROUND: ORANGE (REFLECTIVE)  
LEGEND: BLACK (NON-REFLECTIVE)  
NOTE: ASSUME 3 INCH CAPS SERIES "C" LETTERS.



**SIGN SP-3**

BACKGROUND: ORANGE (REFLECTIVE)  
LEGEND: BLACK (NON-REFLECTIVE)  
NOTE: ASSUME 3 INCH CAPS SERIES "C" LETTERS. SIGN MAY NEED TO BE WIDER BASED ON ROAD NAME WIDTH DECISION.



**SIGN SP-2**

BACKGROUND: ORANGE (REFLECTIVE)  
LEGEND: BLACK (NON-REFLECTIVE)  
NOTE: ASSUME 3 INCH CAPS SERIES "C" LETTERS.



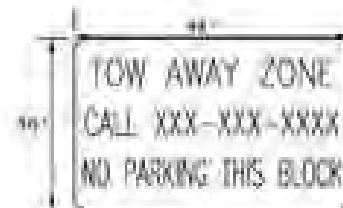
**SIGN SP-5**

BACKGROUND: ORANGE (REFLECTIVE)  
LEGEND: BLACK (NON-REFLECTIVE)  
NOTE: ASSUME 3 INCH CAPS SERIES "C" LETTERS.



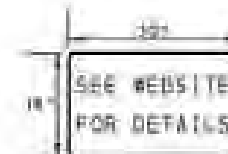
**SIGN SP-6**

BACKGROUND: ORANGE (REFLECTIVE)  
LEGEND: BLACK (NON-REFLECTIVE)  
NOTE: ASSUME 3 INCH CAPS SERIES "C" LETTERS.



**SIGN SP-3**

BACKGROUND: WHITE (NON-REFLECTIVE)  
LEGEND: RED (NON-REFLECTIVE)  
NOTE: ASSUME 3 INCH CAPS SERIES "C" LETTERS.



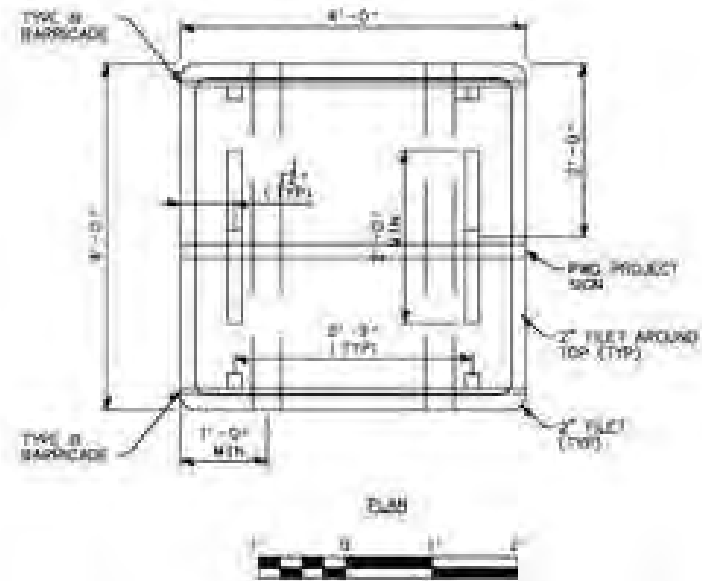
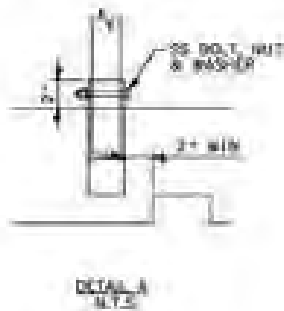
**SIGN SP-6**

BACKGROUND: ORANGE (REFLECTIVE)  
LEGEND: BLACK (NON-REFLECTIVE)  
NOTE: ASSUME 3 INCH CAPS SERIES "C" LETTERS.

# DRAFT

<b>PHILADELPHIA WATER</b> <small>EST. 1981</small>	
PROJECT NAME:	
STREET/BLOCK:	
FWD CONSTRUCTION ZONE STANDARDS SIGN DETAILS	
DATE: JUNE 2018	13
SCALE: N/A	
DRAWN BY:	
CHECKED BY:	
SHEET 13 OF 15	

## PWD CONCRETE SIGN BASE WITH EMBEDDED T-STEEL STAND



# DRAFT

### GENERAL NOTES

1. DESIGN WIND PRESSURE OF 14 PSF BASED ON EQUATIONS IN ASCE 7-10, THIRD PRINTING.
2. SIGN IS DESIGNED FOR A THREE SECOND WIND DUST OF 85 MPH. WHEN WIND DUSTS ARE EXPECTED TO EXCEED THIS LIMIT, REMOVE SIGN.
3. PROVIDE STRUCTURAL STEEL WITH A MINIMUM YIELD STRENGTH OF 46 KS FOR STEEL POST.
4. PROVIDE GRADE 60 REINFORCING STEEL THAT MEETS ASTM A615, A618, OR A706 REQUIREMENTS.
5. PROVIDE REINFORCING CLASS A CONCRETE WITH 28 DAY COMPRESSIVE STRENGTH OF 3,000 PSI.
6. GALVANIZE ALL STEEL COMPONENTS.
7. DESIGN IN ACCORDANCE WITH LRFD METHOD FOR STEEL POSTS.
8. SEE SHEET 3 FOR SIGN ATTACHMENT DETAILS AND CONCRETE BASE REINFORCEMENT LAYOUT.
9. ALL 3/8 (STAINLESS STEEL) BOLTS ARE 1/2" MINIMUM UNLESS SPECIFIED.

<b>PHILADELPHIA WATER</b> EST. 1801	
PROJECT NAME:	
STREET/BLOCK:	
PWD CONSTRUCTION ZONE STANDARDS PWD CONCRETE SIGN BASE DETAIL	
DATE: JUNE 2018	14
SCALE: NTS	
DRAWN BY:	
DESIGN BY:	
CHECKED BY:	SHEET 14 OF 15

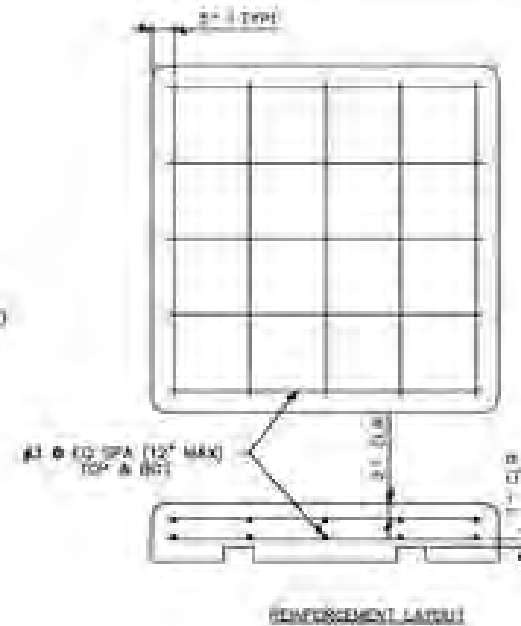


**PWD SIGN BASE  
MISCELLANEOUS SIGN DETAILS**



- NOTES
1. ATTACH PHILADELPHIA PWD PROJECT SIGN BANNER TO STEEL FRAME. ATTACH SS CLAMPS TO BRASS GROMMETS IN SIGN TO SECURE BANNER TO FRAME.
  2. OTHER ALLOWABLE ALTERNATIVES TO SECURE PWD PROJECT SIGN TO STEEL FRAME INCLUDE BUNGEE STRAPS OR PLASTIC TIE.

PHILADELPHIA PWD  
STEEL SIGN WITH  
STEEL FRAME ATTACHMENT



**DRAFT**

 PHILADELPHIA <b>WATER</b> EST. 1861	
PROJECT NAME:	
STREET/BLOCK:	
PWD CONSTRUCTION ZONE STANDARDS PWD SIGN BASE MISCELLANEOUS SIGN DETAILS	
DATE: JUNE 2018	15
SCALE: N/A	
DESIGN BY:	
CHECKED BY:	
SHEET 15 OF 15	

APPENDIX E – GREEN INLET CURB MARKER DETAIL



2.5 Cut Diameter

Color: C: 100 M: 0 Y: 94 K: 24

APPENDIX F - SCHEDULE TEMPLATE

# Schedule Template

WEEK NO.		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
<b>Activity</b> 1. [Activity Name] 2. [Activity Name] 3. [Activity Name] 4. [Activity Name] 5. [Activity Name]	1												
	2												
	3												
	4												
	5												
<b>Activity</b> 1. [Activity Name] 2. [Activity Name] 3. [Activity Name] 4. [Activity Name] 5. [Activity Name]	1												
	2												
	3												
	4												
	5												
<b>Activity</b> 1. [Activity Name] 2. [Activity Name] 3. [Activity Name] 4. [Activity Name] 5. [Activity Name]	1												
	2												
	3												
	4												
	5												
<b>Activity</b> 1. [Activity Name] 2. [Activity Name] 3. [Activity Name] 4. [Activity Name] 5. [Activity Name]	1												
	2												
	3												
	4												
	5												

## Schedule

1. [Text]

### WEEK NO. & WEEKLY SCHEDULE

- 1. [Text]
- 2. [Text]
- 3. [Text]
- 4. [Text]
- 5. [Text]
- 6. [Text]
- 7. [Text]
- 8. [Text]
- 9. [Text]
- 10. [Text]
- 11. [Text]
- 12. [Text]

**LEGEND**  
 P - PACTE  
 B - BARRIERS  
**RELATIONSHIP OF INTERACTIONS**  
 1. [Text]  
 2. [Text]  
**LEGEND**  
 1. [Text]  
 2. [Text]  
 3. [Text]





Work Item: 640224846  
 WPI: 12110  
 Date: 1/1/2022

Location	Customer Information	Start or Phase	Completion or Renewal	Service Start	Service Complete		
110110001 110110001	Customer Name	01/01/2022	01/01/2022				
	Product Name	01/01/2022	01/01/2022				
	SL Contract	01/01/2022	01/01/2022				
	SWID	01/01/2022	01/01/2022			01/01/2022	01/01/2022
	SWID (cont)						
	SWID (cont)						
110110001 110110001	Customer Name	01/01/2022	01/01/2022				
	Product Name	01/01/2022	01/01/2022				
	SL Contract	01/01/2022	01/01/2022				
	SWID	01/01/2022	01/01/2022			01/01/2022	01/01/2022
	SWID (cont)						
	SWID (cont)						
110110001 110110001	Customer Name	01/01/2022	01/01/2022				
	Product Name	01/01/2022	01/01/2022				
	SL Contract	01/01/2022	01/01/2022				
	SWID	01/01/2022	01/01/2022			01/01/2022	01/01/2022
	SWID (cont)						
	SWID (cont)						
110110001 110110001	Customer Name	01/01/2022	01/01/2022				
	Product Name	01/01/2022	01/01/2022				
	SL Contract	01/01/2022	01/01/2022				
	SWID	01/01/2022	01/01/2022			01/01/2022	01/01/2022
	SWID (cont)						
	SWID (cont)						

**Milestone Date List**

Page No. \_\_\_\_\_ of \_\_\_\_\_

**MSA Range & Renewal Locations**

- 01 - East Midwest
- 02 - West Midwest
- 03 - North Midwest
- 04 - South Midwest
- 05 - MSU Training & Dev
- 06 - Intel Process & Dev
- 07 - Intel Service & Management
- 08 - Intel Network Management
- 09 - Intel Services & Dev
- 10 - Intel Services & Dev
- 11 - Intel Support & Services
- 12 - Intel Support & Services

	MSA Range	MSA Renewal
01	01/01/2022	01/01/2022
02	01/01/2022	01/01/2022
03	01/01/2022	01/01/2022
04	01/01/2022	01/01/2022
05	01/01/2022	01/01/2022
06	01/01/2022	01/01/2022
07	01/01/2022	01/01/2022
08	01/01/2022	01/01/2022
09	01/01/2022	01/01/2022
10	01/01/2022	01/01/2022
11	01/01/2022	01/01/2022
12	01/01/2022	01/01/2022

Printing on 01/01/2022 10:00:00 AM. The data is current as of 01/01/2022 10:00:00 AM.

APPENDIX G - BLS MATERIALS ENGINEERING LAB REQUEST FOR TEST

<b>REQUEST FOR TEST</b>		TO:		MATERIALS ENGINEERING LABORATORY 1500 E. HUNTING PARK AVE., PHILA., PA 19124 (215) 685-1430		LAB. NO.
		SAMPLE NO.	MANUFACTURER	DATE		
CONTRACT NO. OR JOB		LOCATION				
DESCRIPTION OF SAMPLE						
INTENDED USE						
SPECIFICATION						
<input type="checkbox"/> MATERIALS NOW IN USE <input type="checkbox"/> MATERIAL SUBMITTED PRIOR TO USE						
REMARKS						
SUBMITTING DEPT. AND UNIT			PHONE NO.		ENGINEER OR INSPECTOR (Signature)	

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APPENDIX H – SPARE PARTS DELIVERY SLIP

PHILADELPHIA WATER DEPT. WORK NO.: S-50329-G  
 PROJECT: ZIEHLER PLAYGROUND AND RECREATION CENTER  
 CONTRACTOR:  
 CONST. ENGINEER:  
 INSPECTOR:

**INSTRUCTIONS: One signed copy is for the BRC Garage and one signed copy is for the Contractor. Please scan and email a signed copy to the Construction Branch Project Manager.**

Spare parts listed below shall be delivered to the following address per specifications:

Attn:  
 Edward Force  
 Cell: 267-909-0151  
 PWD Collectors System Yard  
 Fox Street and Abbottsford Avenue  
 Philadelphia, PA 19129

SPARE PARTS	SPEC SECTION	PROJECT QTY	QTY DELIVERED
Permanent inlet protection sediment bag	02700	12	
Extra hardware kit for permanent inlet protection sediment bag	02700	12	
Permanent protection sediment filter bag for overflow structure	02707	4	

**This signature confirms delivery and receipt of the items listed above:**

CONTRACTOR SIGNATURE:

\_\_\_\_\_

RECEIVED BY:

\_\_\_\_\_ APPENDIX L: LANDSCAPING  
 QUALIFICATIONS FORM

The completion of this form during the submittal phase of the contract by the Contractor or subcontractor who performs such work as procuring planting materials, making deliveries of planting materials, and installing and maintaining landscaping.

Application for Experience Qualification Submitted By: \_\_\_\_\_  
 \_\_\_\_\_

Name, Phone Number, Email Address of Contact Person: \_\_\_\_\_  
\_\_\_\_\_

Type of Organization: \_\_\_\_\_  
(corporation, partnership, or individual) (Circle one)

Principal Office  
Address: \_\_\_\_\_  
Telephone Number: \_\_\_\_\_  
Contact Person: \_\_\_\_\_

If **Corporation**, provide the following:

Date of Incorporation: \_\_\_\_\_  
State of Incorporation: \_\_\_\_\_  
Chief Executive Officer's Name: \_\_\_\_\_  
President's Name: \_\_\_\_\_  
Vice President's Name(s): \_\_\_\_\_  
Secretary's Name: \_\_\_\_\_  
Treasurer's Name: \_\_\_\_\_

If a **Partnership**, provide the following

Date of organization: \_\_\_\_\_  
Is partnership general or limited? \_\_\_\_\_  
Name and address of each partner: \_\_\_\_\_

If an **Individual**, provide the following:

Name and business address: \_\_\_\_\_

**General Information:**

1. How many years has your organization been in business as a contractor under your present license number? \_\_\_\_\_
2. Primary type of work your company performs: \_\_\_\_\_
3. Number of people permanently employed: \_\_\_\_\_
4. How many years' experience in the proposed type and size of landscaping work has your organization had as a contractor? \_\_\_\_\_
5. Will be implementing this project based on (**check those applicable**):
  - Procurement and delivery of landscaping materials.
  - Installation of landscaping materials.
  - Maintenance of landscaping materials.
  - Other (specify): \_\_\_\_\_

List the most recent landscaping installation and maintenance projects your organization has successfully performed in the last 10 years that are similar in type and size to the work proposed

herein to demonstrate the required experience. Attach project references demonstrating compliance with the minimum experience required in Sections 02900 and 02920.

(Provide an attachment if additional space is required or alternate format is required.)

Name, Address of Owner; Contact Person and Phone Number/Email	Project Responsibilities	Complete Date	Type, Volume, and Surface Area	Contract Amount

6. List the certifications of your organization. Attach licenses and certifications demonstrating compliance with the minimum experience required in Sections 02900 and 02920.

(Provide an attachment if additional space is required or alternate format is required.)

Name, Address of Owner; Contact Person and Phone Number/Email	Project Responsibilities	Certification	Certification Date

7. Name the landscape foreperson who will be in direct charge of proposed subcontractor work if awarded this Contract and state relevant experience. Provide the project owner’s name, contact information, and date of work for at least two of the projects listed, if not provided above.

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All above information submitted is correct and true to the best of my knowledge as of the date of this form submission during the submittal phase of the contract:

By \_\_\_\_\_  
Title \_\_\_\_\_  
Date \_\_\_\_\_

## APPENDIX M - MONTHLY PLANTING PROJECT STATUS REPORT

Monthly Project Status Report		
Insert Company Logo	[COMPANY NAME]	
	[Address]	
	[City, State, and zip]	
	[Phone #]	
Reporting Period Start Date: _____	[mm/dd/yyyy]	Reporting Period End Date: _____
[mm/dd/yyyy]		
<b>Attn:</b>		
Rachel Streit, Ashley M. Willis		
Philadelphia Water Department		
Office of Watersheds		
1101 Market Street - 4th floor		
Philadelphia, PA		
19107		
Work Number: _____	[XXXXXX]	
Site Name: _____		
Brief Description of Project:		
Schedule of Activities		
Task (planting, maintenance activities, other)	Photo Reference	Date
		[mm/dd/yyyy]
<i>*insert more lines if needed</i>		
Work Number: _____	[XXXXXX]	
Site Name: _____		
Brief Description of Project:		
Schedule of Activities		
Task (planting, maintenance activities, other)	Photo Reference	Date
		[mm/dd/yyyy]