# TOWN OF BLOOMING GROVE ORANGE COUNTY, NEW YORK

# **PROJECT MANUAL**

# LASSER PARK SENIOR CENTER CONTRACT 2G - GENERAL CONSTRUCTION CONTRACT 2E - ELECTRICAL CONSTRUCTION

# Prepared for



# Prepared by



BID SET AUGUST 2023

# TOWN OF BLOOMING GROVE ORANGE COUNTY, NEW YORK

#### PROJECT MANUAL

#### LASSER PARK SENIOR CENTER

CONTRACT 2G - GENERAL CONSTRUCTION

CONTRACT 2E - ELECTRICAL CONSTRUCTION

Prepared By

# D&B ENGINEERS AND ARCHITECTS WOODBURY, NEW YORK

AUGUST 2023





# TOWN OF BLOOMING GROVE LASSER PARK SENIOR CENTER CONTRACT 2G - GENERAL CONSTRUCTION CONTRACT 2E - ELECTRICAL CONSTRUCTION

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#### SECTION 02000

#### SITE WORK GENERAL PROVISIONS

#### PART 1 - GENERAL

Applicable provisions of the "Conditions of the Contract" shall govern the work of this section and under Division 2.

#### 1.1 SCOPE/SUMMARY

- The Drawings and Specifications are intended to provide Α. for a complete and ready for operation installation. However, both the Drawings and Specifications are for the Contractor's guidance and are not intended to give every detail of the existing conditions installations nor do they describe every fitting required for the installation of the work. The General Contractor shall furnish, install, and place workmanlike manner all equipment, accessories, supports, fittings, and all other material needed for the complete installation.
- B. Before submitting their proposal, the Contractor shall be fully informed to the extent, character, and intent of the work to be completed under their contract. No consideration will be granted for any misunderstanding of the material to be furnished or work to be performed.
- C. Perform all work in accordance with all applicable local, state, and federal codes, laws, and ordinances.
- D. Sediment and erosion control procedures shall be performed as required and in conformance with Section 02271, Sedimentation and Erosion Control Greater than 1 Acre.
- E. The project is of a size and scope that requires a Storm Water Pollution Prevention Plan (SWPPP) refer to the pertinent Appendix attached to these specifications for additional documentation and conform to its requirements in conjunction with and as related to this section.

#### 1.2 GENERAL PROVISIONS

#### A. Verifying Existing Conditions:

1. The Contractor, before submitting their bid, shall examine the site to which this work is in any way dependent upon according to the intent of these Specifications and accompanying Drawings. They shall report to the Engineer, in writing, prior to their bid any conditions which prevent them from performing their work. No "Waiver of Responsibility" for inadequate, incomplete, or defective work will be considered by the Engineer unless written notice has been filed by the Contractor.

#### B. Cooperation:

- 1. When a project involves construction on an existing occupied site, the work called for in this Specification and indicated on the accompanying Drawings shall be carried on in conjunction with the continued operation of the Site and shall be so arranged that its installation and operation will conform with and facilitate the early installation of work.
- 2. The Contractor shall bear the expense required to revise their work due to any failure to coordinate the installation of their work with that of the Site operations.
- 3. The Contractor shall be responsible for the distribution and information concerning their work as required for the prompt installation and coordination with other trades.

#### C. Accessibility and Clearances

1. The Contractor shall inform themselves fully regarding peculiarities and limitations of space for the installation of the materials and equipment under Division 2. The Contractor shall verify all dimensions and conditions in the field. No extra compensation will be allowed because of differences between actual dimensions and the sizes shown on the Drawings.

- 2. The Contractor shall see that equipment and apparatus necessary to be reached from time to time for operation and maintenance are made easily accessible.
- 3. Although the location of items may be shown on the Drawings in a specific place, the construction may disclose the fact that the location for this work does not make its position easily and quickly accessible. In such case, the Contractor shall call the Engineer's attention to same before installing the work and shall be guided by the Engineer's instruction.

#### 1.3 PRELIMINARY WORK

- A. Before starting the work, make a thorough inspection of the work area to determine the physical condition of natural features and adjacent improvements to remain.
- B. Provide complete mark out/tone out of existing utilities for coordination of proposed work. Repair any damage that occurs to existing utilities to remain at no additional cost to the Owner.
- C. Notify all authorities owning utility lines running to or on the property. Protect and maintain all utility lines that are to remain on the property and cap those that are not required in accordance with the instructions of the utility companies or local authorities having jurisdiction over them.

#### PART 2 - PRODUCTS - NOT APPLICABLE

#### PART 3 - EXECUTION

#### 3.1 PROTECTION

A. The Contractor shall effectively protect, at their expense, all materials and equipment, including their employees, during the period of construction, and they shall be held responsible for all damage done to their work, until the same is fully accepted by the Engineer.

- B. Provide protection necessary to prevent damage to existing building(s), concrete, pavement, utilities or vegetation indicated on the Contract Documents to remain. Box or otherwise protect from damage all trees, shrubs, lawns, etc. which are to be preserved. Trees shall be kept free from guy lines. Remove all protection when work is completed and when authorized to do so by the Engineer.
- C. Protect improvements on adjoining properties and on Owner's property.
- D. Restore damaged improvements to original condition as acceptable to Engineer and/or Owner.
- E. Protect the property, adjoining properties, wetlands, etc. from damage by soil erosion as indicated in the projects Storm Water Pollution Prevention Plan.
- F. Conduct site operations to ensure minimum interference with parking lots, roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct parking lots, streets, walks, or other occupied or used facilities without permission from the Owner and/or Engineer.
- G. Provide traffic control as required, in accordance with the New York State Department of Transportation "Manual of Uniform Traffic Control Devices" and the local jurisdiction traffic safety requirements.
- H. Streets, roadways, parking lots, etc. shall be thoroughly cleaned and/or swept daily.

#### 3.2 CLEARING AND GRUBBING

- A. Clear and grub in the areas of the proposed building, paved areas and/or site improvements in preparation for rough grading and new construction.
- B. Completely remove all trees, shrubs, stumps, roots, vegetation, growth, paving, boulders, rocks, rubbish, and all other material interfering with the installation of new construction or not suitable for rough or finished grading, except trees or shrubs directed or indicated to remain.

- C. Remove all roots 1" in diameter or larger. Remove all boulders and rocks larger than 3" in largest dimension.
- D. Remove all topsoil, peat, and soils containing a high degree of organic matter. (Coordinate with Item 3.3 below)
- E. Remove all soft clay soils and rubbish fills.
- F. Excavation resulting from the removal of trees, roots, and the like shall be filled with suitable on-site material or imported fill as approved by the Engineer. Place fill material in horizontal layers not exceeding 8" loose depth, and thoroughly compacted per fill requirements.

#### 3.3 STRIPPING AND STOCKPILING EXISTING TOPSOIL

- A. Existing topsoil and sod on the site within areas designated on the drawings shall be stripped to whatever depths encountered to prevent intermingling with underlying subsoil or other objectionable material. Cut heavy growths of grass from areas before stripping.
- B. Free the topsoil of stones, roots, brush, rubbish, clay or other unsuitable materials/objects over 2" in diameter and remove the latter from the premises before stockpiling the topsoil.
- C. Care shall be taken not to contaminate the topsoil with clay or other unsuitable materials and remove the latter from the premises before stockpiling the topsoil.
- D. Stockpile topsoil in storage piles where indicated or permissible within site staging perimeter (coordinate with Engineer and/or Owner). Construct storage piles to freely drain surface water. Cover storage piles as required to prevent windblown dust. Excess topsoil shall be removed from the site by the Contractor unless specifically noted otherwise on the drawings.
- E. Refer to soil erosion and sediment control Drawings for additional details.

#### 3.4 DEMOLITION

- A. Existing structures (where indicated), concrete and paving on the site (where indicated), including all existing/discovered inactive cesspools, cisterns, wells, foundation materials shall be completely demolished, and all debris removed from the site. Excavation resulting from the removal sub-surface structures, foundations/footings shall be filled with suitable on-site material or imported fill as approved by the Engineer. Place fill material in horizontal layers not exceeding 8" loose depth, and thoroughly compacted per fill requirements.
- B. Remove existing above grade and below grade improvements and abandoned underground piping or conduit as shown on the drawings or necessary to permit construction and other work.
- C. All work shall be executed in such a manner as not to endanger the safety of the workmen or the public. All barriers and precautionary measures shall be erected as required.

#### 3.5 REMOVAL AND DISPOSAL

- A. Dispose of all debris resulting from the work of this Section. Haul off-site and dispose of legally.
- B. Do not burn rubbish, organic matter, etc. on the Site.
- C. Do not bury concrete, rock, stumps/roots, etc. on the Site.

++ END OF SECTION ++

#### SECTION 02100

#### CLEARING AND GRUBBING

#### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. Scope: The General Contractor shall furnish all labor, materials, equipment and incidentals required to perform all clearing and grubbing as shown and specified.
- B. Related Work Specified Elsewhere:
  - 1. Section 02050, Demolition and Removals.
  - 2. Section 02200, Earthwork.
- C. The Work covered by this Section consists of removing and disposing of all trees, stumps, bushes, roots, shrubs, vegetation, logs, rubbish, and other objectionable material from the project site within areas shown on the Contract Drawings to be cleared or as required to perform the work. Work under this Section also includes stripping and stockpiling of topsoil which may be reused.
- D. The Contractor shall visit the site prior to submitting their bid to determine the extent of clearing and grubbing required.

#### 1.2 QUALITY ASSURANCE

A. Codes and Standards: State and local laws and code requirements shall govern the hauling and disposal of trees, shrubs, stumps, roots, rubbish, debris and other matter.

#### 1.3 JOB CONDITIONS

#### A. Protection:

1. Streets, roads, adjacent property and other works and structures shall be protected throughout the entire project. Contractor shall return to

- original condition, satisfactory to the Engineer, facilities damaged by the Contractor's operations.
- 2. Trees, shrubs and grassed areas which are to remain shall be protected by fences, barricades, wrapping or other methods. Equipment storage, material stockpiles, etc., shall not be permitted within tree branch spread.
- 3. Topsoil stripped for new construction shall be stockpiled and shall not be mixed with other soils.
- 4. No trees, shrubs, roots, branches, wood, concrete, or other debris shall be buried in fills, embankments or stockpiles.
- 5. No cleared matter, debris or soils shall be stored in construction work.

#### 1.4 GUARANTEE

A. Contractor shall guarantee that Work performed under this Contract will not permanently damage trees, shrubs, turf or plants designated to remain, or other adjacent work or facilities. If damage resulting from Contractor's operations appears during the period up to 24 months after completion of the project, the Contractor shall replace damaged items at their expense.

#### PART 2 - PRODUCTS - NOT APPLICABLE

#### PART 3 - EXECUTION

#### 3.1 CLEARING AND GRUBBING

- A. Clearing and grubbing shall be confined to areas within the Contract limit lines except as otherwise shown. Damages outside these limits caused by the Contractor's operations shall be corrected at the Contractor's expense.
- Except as noted below, Contractor shall remove from the site and satisfactorily dispose of all trees, shrubs, stumps, roots, brush, vegetation, masonry, rubbish, scrap, debris, pavement, curbs, fences and miscellaneous other structures not covered under other Sections as shown, specified or otherwise required to permit construction of the new Work.

- C. In the event that the existing vegetative ground cover re-establishes itself between the time that the area was cleared and grubbed, and prior to the performance of the Work in that area, the Contractor shall re clear the area by tracking with a bulldozer to grind up the vegetation and incorporate it into the loosened soil, at no additional cost to the Owner. The Contractor shall not receive additional compensation for re clearing an area which has previously been cleared as part of the prosecution of the Work
- D. Burning of materials is expressly forbidden.
- E. Trees and shrubs to be removed.
  - 1. Remove trees and shrubs in such a manner to avoid damage to trees and shrubs designated to remain. Removal of trees and shrubs shall include their respective stumps and roots.
- F. Trees and shrubs to be saved.
  - Protect all other trees and shrubs from defacement, injury and destruction. Preserve trees within the contract limits that are so delineated on the Plans or are marked in the field by red paint.
  - 2. Do not cut roots unnecessarily; handwork or otherwise prevent damage to roots which extend into grading limits or limits of excavation. Disturb roots as little as possible when tunneling under trees. Backfilling around tree roots shall be done immediately after completion of construction in the vicinity of trees.
  - 3. The Contractor shall be responsible for the protection of all vegetation from damage resulting from emissions from motorized equipment.
  - 4. During working operation, protect the trunk, foliage, and root system of all trees to be saved with boards or other guards and as required to prevent damage, injury and defacement. Do not pile excavated material adjacent to the base of any trees. Do not allow runoff to accumulate around base of trees. Do not fasten or attach ropes, cable, or guy wires to trees without permission of the Engineer. When such permission is granted,

protect the tree before making fastening or attachments by providing burlap wrapping and softwood cleats. The Contractor shall be held responsible for damage resulting from these actions. Use of axes or climbing spurs for trimming will not be permitted. Provide climbing ropes during trimming.

- 5. Remove shrubs to be saved, taking a sufficient earth ball at the roots to maintain the shrub. Temporarily replant if required, and replace at the completion of construction in condition equaling the original.
- 6. Tree and shrub repair where required shall be performed by a tree surgeon.
- 7. Trees and shrubs intended to remain which are damaged beyond repair by construction, shall be replaced by the Contractor at no expense to the Owner.

#### 3.2 TOPSOIL REMOVAL

- A. Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4 inches. Topsoil shall be substantially free of subsoil, clay lumps, stones, and other objects over 2 inches in diameter, and without weeds, roots, and other objectionable material.
- B. Strip topsoil which is satisfactory to whatever depths are encountered, and in such manner as to prevent intermingling with the underlying subsoil or other objectionable material. Remove heavy growths of grass from areas before stripping. Where trees are shown or directed to be left standing, stop topsoil stripping a sufficient distance from such trees to prevent damage to the main root system.
- C. Stockpile topsoil in storage piles in areas shown, or where otherwise approved by Engineer. Construct storage piles to freely drain surface water. Cover storage piles to prevent windblown dust. Topsoil in excess of quantity required shall remain the property of the Owner. The Contractor shall stockpile and cover stripped topsoil in the area approved by the Engineer.

+ + END OF SECTION + +

#### SECTION 02140

#### **DEWATERING**

#### PART 1 - GENERAL

#### 1.1 WORK INCLUDED

- A. The General Contractor shall furnish all labor, materials, and equipment, and perform all work necessary to lower and control the groundwater levels and hydrostatic pressures to permit all excavations and construction to be performed in dry conditions.
- B. The work shall include the installation, testing, operation, maintenance, supervision, dewatering, rewatering, and final dismantling and removal from the site of the dewatering system as needed and as described herein. It shall also include the cost of any replacement or rehabilitation of the subgrade or structures damaged due to dewatering system failures or Contractor negligence. The Contractor shall be responsible for compliance with all regulations relating to this work in accordance with the requirements of the General Conditions.
- C. Dewatering shall include the diversion, collection, and removal of all ice, snow and surface runoff from the work areas; and removal of groundwater from new excavations to permit construction in the dry.
- D. The Contractor shall select the specific type, size and arrangement of the dewatering system to perform correctly and as described herein.

#### 1.2 RELATED WORK

- A. Section 02200, Earthwork.
- B. Section 02271, Sedimentation and Erosion Control Greater than 1 Acre.

#### 1.3 GENERAL INFORMATION

A. Prior to any excavation, the dewatering system shall be placed in operation to lower the water level, as

required. Thereafter, the system shall be operated continuously 24 hours per day, 7 days per week until all work has been satisfactorily completed, including placement of fill materials, and dewatering is no longer required as determined by the Owner. An adequate weight of fill material shall be in place to prevent buoyancy prior to discontinuing operation of the dewatering system.

B. The Contractor shall provide power for the dewatering, including all costs for installation, energy and fuel. Standby power shall be supplied by diesel powered engine generators. An alarm shall be installed by the General Contractor to signal the loss of the primary power source. For any fuel powered system, the Contractor shall maintain a 5-day fuel supply on site. Storage of fuel shall include a secondary containment structure, in accordance with the Owner requirements.

#### 1.4 EXAMINATION OF THE SITE

- A. The Contractor shall take all the steps considered necessary to familiarize themselves with the surface and subsurface site conditions, and shall obtain the data that is required to analyze the water and soil environment at the site and to assure that the materials used for the dewatering systems will not erode, deteriorate, or clog to the extent that the dewatering systems will not perform properly during the period of the dewatering.
- B. Prior to starting dewatering operations, the Contractor and the Owner shall make a joint inspection of the condition of all existing structures on the site to establish their present condition. Photographs shall be taken to record any conditions that may become the subject of possible damage claims against the Contractor. Photographs shall be taken in accordance with the requirements of the General Conditions.

#### 1.5 SUBMITTALS

- A. The Contractor shall prepare and submit a notification letter to the Owner with:
  - 1. The proposed starting date of the dewatering operation.

- 2. The details of the dewatering system to be installed.
- 3. The pump capacity, pumping rate, and expected volume of water to be withdrawn.
- 4. The location of water discharge.
- 5. The expected duration of the operation.

#### B. Shop Drawings

Each submittal shall be complete in all respects incorporating all information and data listed herein and all additional information required for evaluation of the proposed Dewatering System's compliance with the Contract Documents.

Partial, incomplete or illegible submissions will be returned to the Contractor without review for resubmittal.

Shop drawings shall include, but not be limited to:

- 1. Plans showing the methods and location of dewatering and discharge. The drawings shall include a sufficient number of detailed sections to clearly illustrate the scope of work. The relationship of the dewatering system, discharge line to existing buildings, other structures, utilities, streets and new construction shall be clearly indicated. Utility locations shall be shown.
- 2. Lists of materials and equipment to be used including details of installation.

The Owner's review of shop drawings and related submittals shall be made to verify that the general scope of work is adequate, and that the Contractor is qualified to perform the Work as shown on the Drawings. Acceptance of the Contractor's plans and methods of construction by the Owner shall not be construed to relieve the Contractor in any way from their responsibility for the successful performance of the dewatering work.

#### PART 2 - PRODUCTS - NOT USED

#### PART 3 - EXECUTION

#### 3.1 DEWATERING SYSTEM REQUIREMENTS

#### A. General

The dewatering system shall be installed from the existing ground surface or from the bottom of an excavation which is located above the groundwater level. The system design shall be based on the groundwater level and shall be capable of relieving all hydrostatic pressure against the height of the excavation walls and lowering the hydrostatic level below the bottom of the subgrade a minimum of 3 feet in the work areas both prior to excavation, and during excavation and construction.

#### B. Responsibility

The Contractor shall be solely responsible for the design, construction, arrangement, location, and depths of the dewatering system necessary to accomplish the work described herein. The dewatering shall be accomplished in a manner that: will prevent the loss of fines, seepage, boils, quick conditions or softening of the foundation strata; will maintain stability of the sides and bottom of the excavation; and will result in all construction operations being performed in the dry.

#### C. Dewatering Criteria

Only after the entire dewatering system has been installed, the system tested to the Owner's satisfaction, and all temporary earth support systems within the affected drawdown area have been installed to their full depth will dewatering of the excavation be allowed.

#### 3.2 COORDINATION

A. The scheduling and progress of the dewatering work shall be coordinated with all other related work such as excavation, sheeting, pouring of concrete walls and slabs, utility installation, backfill and compaction, or any other operation that might be affected by this work.

#### 3.3 SURFACE WATER

A. The Contractor shall provide, operate and maintain all ditches, berms, site grading, sumps and pumping facilities to divert, collect and remove all surface water from work areas. All collected water shall be discharged, as indicated on the Drawings and/or as approved by NYSDEC.

#### 3.4 DISPOSAL OF DEWATERING SYSTEM DISCHARGE

A. The discharge from the dewatering system shall be carried in pipes out of the area of the work and discharged as shown on the Drawings and/or as approved by the Owner.

#### 3.5 PERFORMANCE

- A. Ground water shall not be discharged directly into creeks, ponds, lakes or waterways without written permission from the proper authorities.
- B. All catch basins or recharge basins adversely affected by the accumulation of silt resulting from dewatering operations, shall be restored by the Contractor to their original condition. This work shall be done at no additional cost to the Owner.
- C. Noise levels for dewatering pumps measured at a distance of 25 feet from the pumps shall not exceed 60 dB.

+ + END OF SECTION + +



#### SECTION 02200

#### **EARTHWORK**

#### PART 1 - GENERAL

#### 1.1 SUMMARY

#### A. Scope:

- Each Contractor shall perform all excavating, backfilling and disposing of earth materials as shown, specified, and required for the purpose of constructing pipelines, concrete work, grading, and other facilities.
- 2. All necessary preparation of subgrade shall be included.
- 3. For the purpose of disposal, excavated materials shall be classified as follows:
  - a. Organic materials shall be disposed off-site at New York State Department of Environmental Conservation (NYSDEC) approved disposal sites.
  - b. Unsuitable inorganic materials and excess suitable materials, to be disposed off-site at NYSDEC registered and/or permitted facilities.
- 4. Excavation and backfill performed beyond the extent required to construct the proposed facilities, as shown and specified in the Contract Drawings shall be as specified and directed by Engineer based upon field observation and testing, and shall be paid for under the unit prices bid in the proposal for additional excavation and backfill.

#### B. Sources of Materials:

 General fill materials shall be obtained from on-site excavation work and/or a commercial product obtained from NYSDEC registered and/or permitted off-site sources.

- 2. Select fill materials shall be obtained from onsite excavation work and/or a commercial product obtained from NYSDEC registered and/or permitted off-site sources.
- 3. Nonfrost susceptible fill material shall be a commercial product obtained from NYSDEC registered and/or permitted off-site sources.
- 4. Crushed stone materials shall be a commercial product obtained from NYSDEC registered and/or permitted off-site sources.
- 5. Topsoil, except for topsoil stripped from the work areas, shall be a commercial product obtained from NYSDEC registered and/or permitted off-site sources.
- C. Related Work Specified Elsewhere:
  - 1. Section 02050, Demolition and Removals.
  - 2. Section 02140, Dewatering.
  - 3. Section 02271, Sedimentation and Erosion Control Larger Than 1 Acre.
  - 4. Section 03300, Cast-in-Place Concrete.

#### 1.2 QUALITY ASSURANCE

- A. Permits and Regulations: Contractor shall perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.
- B. Design Criteria:
  - All steel work for sheeting, shoring, bracing and other related work shall be in accordance with the provisions of the AISC "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings," except that field welding will be permitted.

- Contractor shall be wholly responsible for installing and operating the system used to accomplish the required sheeting and bracing.
- C. Reference Standards: Comply with applicable provisions and recommendations of the following except as otherwise shown or specified.
  - 1. ASTM A 328, Steel Sheet Piling.
  - 2. ASTM D 1556, Density and Unit Weight of Soil in Place by Sand-Cone Method.
  - 3. ASTM D 1557, Laboratory Compaction Characteristics of Using Modified Effort (56,000 ft-lbf/ft $^3$  [2,700 kN-m/m $^3$ ]).

#### D. Tests:

- 1. An independent testing laboratory shall be employed by the Contractor to perform the required tests.
- 2. Required tests:
  - a. Select Fill Samples: Gradation ASSTM D7298 and ASTM C136.
  - b. Subgrade Tasts, ASTM D 1557
  - c. Compacted Select Fill: Compaction, ASTM D1557.
  - d. Optimum moisture maximum density curve for each soil used for backfill.
  - e. Field Density Tests on each lift of backfilled material: ASTM D1557, ASTM D2167 or ASTM D6938.

#### 1.3 SUBMITTALS

#### A. Shop Drawings:

1. Submit for approval shop drawings and design calculations of sheeting and bracing systems for excavations deeper than ten (10) feet. Information supplied shall include, as a minimum, type and size

- of sheeting to be used, extent of sheeting and tip and top elevations.
- 2. Submit NYSDEC Authorized Facility registration and/or permit or NYSDOT Materials Management Approval for all fill proposed to be imported to the site.
- 3. Shop drawings and calculations shall be prepared and signed by a Professional Engineer licensed in the State of New York.
- 4. Submit plans of open cut excavations showing side slopes and limits of the excavation at grade where not shown on the Contract Drawings.
- B. Independent Testing Laboratory: Prior to conducting the required tests, the Contractor shall submit, to the Engineer, for approval, the name of the independent test laboratory which will facilitate the required testing.
- C. Samples and Test Results:
  - 1. At least two weeks prior to the date of anticipated use, the Contractor shall submit, to the Engineer, for approval, a representative sample of all on-site and off-site material required. The Contractor shall notify the Engineer in writing of the source of each sample.
  - 2. The Contractor shall provide, along with the above samples, the required test results, excluding the field density test.
- D. Disposal Sites: List of disposal sites for unsuitable materials and all required permits for use of the sites.
- E. Manufacturer's Data: Submit for approval manufacturer's specifications, performance characteristics and operating instructions for the compaction equipment.

#### 1.4 JOB CONDITIONS

- A. Existing Structures:
  - 1. Shown on the Drawings are certain utilities and surface and underground structures located on or

adjacent to the Work. This information has been obtained from existing records. It is not guaranteed to be correct or complete and is shown for the convenience of the Contractor. Contractor shall explore ahead of the required excavation to determine the exact location of all structures and utilities. They shall be supported and protected from injury by the Contractor. If they are broken or injured, they shall be restored immediately by the Contractor at no additional cost to the Owner.

2. Prior to execution of the Work, the Contractor shall check and verify governing dimensions and elevations. The Contractor and Engineer shall jointly survey the condition of adjoining structures. Photographs and records shall be made of any prior settlement or cracking of structures, pavements, and the like, that may become the subject of possible damage claims.

#### B. Existing Utilities:

- Locate existing underground utilities in the areas of Work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.
- 2. Should uncharted or incorrectly charted piping or utilities be encountered during excavation, consult the Owner in keeping respective services and facilities in operation. Repair damaged utilities to the satisfaction of the Engineer.
- 3. Do not interrupt existing utilities serving facilities occupied and used by the Owner or others, except when permitted in writing by Engineer.
- 4. Demolish and completely remove existing underground utilities indicated to be removed.

#### C. Protection of Persons and Property:

1. Barricade open excavations occurring as part of this Work and post with warning lights. Operate warning lights during hours from dusk to dawn each day and as otherwise required.

- 2. Protect structures, utilities, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by Contractor's operations.
- 3. Consult Engineer and obtain their approval before removing or disturbing pipes, structures, or other facilities that are encountered on the line of the excavation.
- 4. Structures, utilities, sidewalks, pavements and other facilities removed or disturbed shall be replaced to their original condition, unless otherwise shown, specified or directed.
- D. Dust Control: Contractor shall conduct all of their operations and maintain the area of their activities, including sweeping and sprinkling of roadways, so as to minimize creation and dispersion of dust. In addition, Contractor shall be responsible for controlling dust caused by their operation of vehicles and equipment, clearing or for any reason whatsoever, in accordance with Section 01560 Environmental Controls.
- E. Odor Control: As an odor abatement measure, cover, at the end of each work day, all areas of organic or odorous material which were exposed during excavation with a minimum 6-in and a maximum 24-in deep of clean fill. Excavated organic or odorous material shall be immediately removed off-site and shall not be stockpiled on-site.
- F. Roadways and Walks: Unless otherwise approved by Engineer, excavated material and materials of construction shall be so deposited, and the Work shall be so conducted, as to leave open and free for vehicular traffic a roadway not less than 10 feet in width. All hydrants, valves, and other facilities which may require access during construction shall be kept accessible for use. During the progress of the Work, Contractor shall maintain such roadways in satisfactory condition and the Work shall at all times be so conducted as to cause a minimum of inconvenience to the Owner and Pedestrians.

# PART 2 - PRODUCTS

#### 2.1 GENERAL REQUIREMENTS FOR ALL FILL MATERIAL

- A. All fill material shall be free of refuse and vegetable matter, frozen material and other objectionable material.
- B. Excavated materials meeting these requirements and the requirements stipulated below for the appropriate type of fill material shall be used when approved by the Engineer. Otherwise the Contractor shall excavate, haul and place material from approved off-site sources.
- C. All fill material from off-site sources shall be a commercial product obtained from NYSDEC registered and/or permitted facilities.
- D. Contractor shall install crushed aggregate and non-frost susceptible fill over a nonwoven, spunbonded, continuous filament, polypropylene geotextile fabric. Geotextile fabric shall be Model Typar 3501 by ADS, or approved equal."

#### 2.2 SOIL MATERIALS

- A. Select Fill: Well graded granular material or bank run gravel, free from organic matter. Not more than 80 percent by weight shall pass through a No. 40 sieve; not more than 10 percent by weight through a No. 200 sieve; and 100 percent shall pass a 3-inch square sieve.
- B. General Fill: Soil materials for general backfill and fill shall be free of organics, clay, debris, waste, frozen materials and other deleterious matter and shall conform to the following gradation.

Sieve Size	Percent Passing by Weight
6-inch	100
No. 40	0-70
No. 200	0-15

- C. Non-frost Susceptible Fill:
  - 1. Non-frost susceptible fill shall be subbase course, type 4, Item no. 304.14 in accordance with the New York State Department of Transportation.
  - 2. The materials shall be at least 95 percent by weight of Recycled Portland Cement Concrete Aggregate (RCA) and free from organic and other deleterious material. This material may contain up to 5 percent by weight asphalt and/or brick. The material shall conform to the following gradation:

Sieve Size	Percent Passing by Weight
2-inch	100
¼-inch	30-65
No. 40	5-40
No. 200	0-10

- 3. Fill shall be installed beneath concrete foundation slabs, concrete decking and pavement as shown on the plans or directed by the Engineer.
- D. Crushed aggregate: Shall consist of crushed stone or crushed gravel conforming to the following gradation:

# Sieve Size Percent Retained on Sieve 3/4-inch 85-100 (throughout)

E. Unsuitable Material: All soils not meeting the requirements of Paragraphs A through D and all organic materials.

#### 2.3 CONCRETE MATERIALS

A. Flowable fill or lean concrete:

Flowable fill shall be low strength concrete, designed and formulated in accordance with ACI 229 "Controlled Low Strength Materials." Flowable fill shall contain cement, fly ash, sand and water. Upon placement, flowable fill shall require no vibration or tamping to achieve 100% consolidation and shall be self-leveling. Flowable fill shall have a wet density of 95 to 110 pounds per cubic

foot and shall achieve a 28-day compressive strength of between 50 to 200 psi. Flowable fill shall be Blue Flow Flowable Fill as manufactured by Eastern Concrete Materials, or approved equal.

# 2.4 SHEETING, SHORING, AND BRACING

- A. Wood Sheeting: Temporary Work: New or used timber meeting the requirements for Douglas Fir Dense Construction grade or Southern Pine No. 2 Dense S3.
- B. Steel Sheeting: Temporary Work: Steel conforming to ASTM A 328. Steel for soldier piles, wales and braces may be new or used and shall conform to ASTM A 36.
- C. Used materials shall be in good condition, not damaged or excessively pitted.

#### PART 3 - EXECUTION

#### 3.1 INSPECTION

A. Contractor shall provide Engineer with sufficient time and means to examine the areas and conditions under which excavating, filling, and grading are to be performed. Work shall not proceed until all unsatisfactory conditions have been corrected in a manner acceptable to Engineer.

#### 3.2 EROSION CONTROL

#### A. General:

- 1. In general, the construction procedures outlined herein shall be implemented to ensure minimum damage to the environment during construction.
- 2. Whenever possible, access and temporary roads shall be located and constructed to avoid environmental damage. Provisions shall be made to regulate drainage, avoid erosion and minimize damage to vegetation. Special care shall be taken to eliminate depressions that could serve as mosquito pools.

- 3. Where areas must be cleared for storage of materials or temporary structures, provisions shall be made for regulating drainage and controlling erosion, subject to Engineer's approval.
- 4. In the event of any temporary work stoppage, the Contractor shall take steps to prevent any temporary or permanent environmental damage to the area undergoing construction.
- 5. All erosion control measures shall comply with the New York State Department of Environmental Conservation's Standards and Specifications for Erosion and Sediment Control.

#### B. Control Measures:

- 1. Temporary measures shall be applied to control erosion and to minimize the siltation of the existing drains, streambeds and natural ponding areas. Such measures shall include but not be limited to the use of berms, baled straw silt barriers, gravel or crushed stone, mulch, grasses, fiber logs, silt fencing, check dams, slope drains and other methods. These temporary measures shall be applied to erodible materials exposed by any activities associated with the construction of this Project.
- 2. Temporary measures shall be coordinated with the construction of permanent drainage facilities and other work to the extent practicable to assure economical, effective, and continuous erosion and siltation control.
- 3. The Contractor shall provide special care in areas with steep slopes. Disturbance of vegetation shall be kept to a minimum to maintain stability. Remove only those trees and shrubs and grasses that must be removed for construction. Protect the rest to preserve their aesthetic and erosion-control values.
- 4. Install erosion and sediment control practices as specified herein and according to soil conservation standards and specifications. The practices shall be maintained in effective working condition during

- construction and until the drainage area has been permanently stabilized.
- 5. Temporarily stabilize each segment of graded or otherwise disturbed land, including the sediment-control devices not otherwise stabilized by seeding and mulching or by mulching alone.

#### 3.3 EXCAVATION

#### A. General:

- Contractor shall perform all excavation required to complete the Work as shown and specified. All material excavated shall be non-classified. It shall include all materials such as earth, sand, clay, gravel, hardpan, boulders, organic materials, rock, rubbish and all other materials within the excavation limits.
- 2. Excavations shall be open type, shored and braced where necessary to prevent injury to workmen and to new and existing structures or pipelines.
- 3. All excavations shall be made in the dry.
- 4. Dispose of excavated material and waste materials as specified herein.

# B. Pipeline Excavation:

- 1. Pipe trenches shall not be excavated below the pipe bottom except where unsuitable material is encountered.
- 2. Trench width shall be minimized to greatest extent practical, but shall conform to the following:
  - a. Sufficient to provide room for installing, jointing and inspecting piping, but in no case wider at top of pipe than pipe barrel outside diameter plus 2.5 feet.
  - b. Enlargements at pipe joints may be made if required and approved by Engineer.
  - c. Sufficient for sheeting, bracing and sloping.

- d. Sufficient to allow thorough compacting of backfill.
- e. Do not use excavating equipment which requires the trench to be excavated to excessive width.

#### C. Structure Excavation:

- 1. Excavation shall be made to the grades shown on the Contract Drawings and to such widths as will give suitable room for construction of the structures, for bracing and supporting, pumping and draining. The bottom of the excavations shall be rendered firm and dry and in all respects acceptable to the Engineer.
- 2. Excavation shall be accomplished by methods which preserve the undisturbed state of subgrade soils. For structures having multiple bearing levels or adjacent structures at different levels, excavation and foundation construction shall first be accomplished at the lowest levels to prevent undermining foundations and disturbing adjacent bearing soils at higher levels.
- 3. Excavation equipment shall be satisfactory for carrying out the work in accordance with the Specifications. Earth shall not be plowed, scraped, or dug with machines so near to the finished subgrade as to result in excavation of, or disturbance of material below grade.
- 4. When excavation for foundations has reached final depths, the Engineer shall be notified and will inspect conditions. If materials and conditions are not satisfactory to the Engineer, the Engineer will issue instructions as to the procedures for correction of the unsatisfactory condition.
- 5. During final excavation to subgrade level, take precautions required to prevent disturbance of material. Hand excavate the final 6 inches as necessary to obtain a satisfactory undisturbed bottom.

#### D. Unsuitable Excavation:

- 1. If any over excavation occurs through error of the Contractor or for the Contractor's convenience, it shall be refilled at the Contractor's expense with concrete, select fill or other material satisfactory to the Engineer.
- 2. If Contractor fails to properly dewater the excavation or trench, or disturbs the subgrade or otherwise fails or neglects to conduct the excavation work in a manner that provides surface of subgrade in proper condition for construction, the Contractor shall remove all disturbed material and replace it with concrete, select fill, or other approved material at their own expense. The condition of the subgrade shall meet with the approval of the Engineer before any work is placed thereon.
- 3. If, in the opinion of the Engineer, the material, in its undisturbed natural condition, at or below the grade of the excavation indicated on the Drawings is unsuitable for foundations, or if organic or silty soil extends below excavation depth, it shall be removed and be replaced with select fill or other suitable material. Suitable material excavated from the site shall be used before select fill from an off-site source is permitted.

# 3.4 SHEETING, SHORING AND BRACING

#### A. General:

- Sheeting, shoring and bracing shall be used where necessary to prevent injury to workers, structures, or pipe lines. Jetting for sheeting installation is prohibited.
- 2. All municipal, county, state and federal ordinances, codes, regulations and laws shall be observed. All trenches shall be shored with the minimal protection of sheeting listed in OSHA Regulations, 29 CFR, Part 1926, Subpart P-Excavations, Trenching and Shoring.

- 3. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.
- 4. Unless otherwise shown, specified, or ordered, all materials used for temporary sheeting shall be removed when work is completed. Such removal shall be made in a manner not injurious to the structure or its appearance or to adjacent Work.
- 5. The clearances and types of the temporary sheeting, insofar as they affect the character of the finished Work, will be subject to the approval of the Engineer but the Contractor shall be responsible for the adequacy of all sheeting, shoring, bracing and other related Work.
- 6. Safe and satisfactory installation of the sheeting shall be the entire responsibility of the Contractor.
- B. Removal of Sheeting and Bracing:
  - 1. Remove sheeting and bracing from excavation unless otherwise ordered in writing by the Engineer. Removal shall be done so as to not cause injury to the Work. Removal shall be equal on both sides of excavation to ensure no unequal loads on pipe or structure. Use of vibratory extractors is prohibited.
  - 2. Defer removal of sheeting and bracing, where removal may cause soil to come into contact with concrete, until wall and floor framing up to and including grade level floors are in place and concrete has attained sufficient strength to withstand the soil and superimposed loads.

# 3.5 BACKFILL AND COMPACTION

- A. Fill excavations as promptly as Work permits, but not until completion of the following:
  - 1. Acceptance by Engineer of all Work within the excavation.

- 2. Inspection, testing approval, and recording of locations of underground utilities, connections, branches, structures and other facilities.
- 3. Removal of temporary shoring and bracing, and backfilling of voids with satisfactory materials.
- 4. Removal of trash and debris.
- B. Excavation shall be kept dry during backfilling operations. Backfills around piping and structures shall be brought up evenly on all sides.
- C. All backfill shall be placed in layers not exceeding 6 inches before compaction in thickness, and each layer shall be compacted as specified below.
- D. All structures and pipe trenches shall be backfilled with the type of material listed below except where shown otherwise on the Contract Drawings.

# Type of Backfill Select Fill Replacement of unsuitable material

removed below bottom slabs of structures, below pipe beddings, and where shown on the drawing.

Non-frost In locations shown on the Susceptible Fill drawings.

Crushed Stone or In locations shown on the Gravel drawings.

General Fill In all locations not enumerated above.

- E. Backfill above and adjacent to pipe, and adjacent to buildings and walls shall be compacted by lightweight equipment, such as "walk behind" vibratory plate compactors. Heavy self-propelled compactors shall not be used until the following criteria are met:
  - 1. A minimum of 18 inches of compacted backfill has been placed above the top of the pipe.
  - 2. Area to be compacted is a minimum distance of three pipe diameters away from the adjacent pipe.

- 3. Area to be compacted is a minimum of 10 feet from building walls.
- F. Hydro hammers or "jumping jack" hammers shall not be used above pipes until a minimum of 3 feet of backfill has been placed and compacted.
- G. Compaction Density Requirements:
  - 1. Unless otherwise noted, the degree of compaction required for all types of fills shall be 95 percent in accordance with ASTM D 1557 (Modified Proctor Test). Material shall be moistened or aerated as necessary to provide the moisture content that will facilitate obtaining the specified compaction.
  - 2. Nonfrost-susceptible fill shall be compacted with a vibratory plate compactor or vibratory rolling compactor. Three complete passes shall be made on each 6-inch thick loose layer. Such pass shall overlap the adjacent previously compacted area a minimum of 20%. Density requirement for nonfrost-susceptible fill will be considered satisfactory upon completion of compaction.
  - 3. The Contractor shall notify the Engineer a minimum of 24 hours prior to starting any compaction operation.
  - 4. Field density tests shall be made by an independent testing laboratory employed by the Contractor to determine the actual density attained in each layer of fill. No fill shall be placed over a layer which has not been tested and approved. Should these tests indicate that the density of any layer of fill or portion thereof is below the required density, the particular layer or portion thereof shall be reworked until the required density has been obtained. Field density test procedures shall conform with ASTM D2167, ASTM D1556, or ASTM D6938. All final test results shall be submitted to the Engineer for review. At least one test per lift or one test per 50 yards placed shall be performed, whichever is greater.

- 5. The moisture content of the fill material shall be at or slightly below the optimum moisture content for the soils being utilized during the entire time when the compactor is working on the fill. If, in the opinion of the Engineer, the fill is too dry for proper compaction, the Contractor shall spray the fill with a sufficient quantity of clean water to bring the fill layer to the proper moisture content. No compactive effort shall be made if the fill is significantly above the optimum moisture content, unless specifically approved by the Engineer.
- 6. No fill material shall be placed, spread or compacted while the ground or fill is frozen or thawing or during unfavorable weather conditions. When work is interrupted, fill operations shall not be resumed unless the moisture content and density of the fill are as previously specified. The fill surface must be made smooth and free from ruts or indentations at the end of any working day when any significant precipitation is forecast and/or at the completion of the compaction operations in that area, in order to prevent saturation of the fill material.
- H. Contractor shall repair, at no additional cost to Owner, after settlement that occurs. They shall make all repairs and replacements necessary within 30 days after notice from the Engineer.

#### 3.6 GRADING

- A. Uniformly grade areas within limits of the Work, including adjacent transition areas. Smooth subgrade surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.
- B. Turfed Areas: Finish areas to receive topsoil to within not more than 1-inch above or below the required subgrade elevations.
- C. Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/4-inch when tested with a 10-foot straightedge.

D. Compaction: After grading, compact subgrade surfaces to the depth and percentage of maximum density required.

# 3.7 DISPOSAL OF EXCAVATED MATERIALS

- A. Excess excavated materials generated by the Work shall be removed from the site and disposed of by the Contractor in accordance with local and state regulations, as directed by the Engineer. No excavated materials suitable for common or select fill shall be removed from the site or disposed of by the Contractor except as directed by the Engineer. Materials designated by the Engineer to remain on site shall be neatly piled at designated locations on-site.
- B. Organic material and material which does not conform to the requirements for backfill shall be disposed of in compliance with these specifications.
- C. Contractor shall not dump soil onto those areas designated as wetlands or waterways. Contractor shall not stockpile or store soil, spoils, debris, materials, tools or equipment on or near wetlands and waterways.

+ + END OF SECTION + +

#### SECTION 02271

#### SEDIMENTATION AND EROSION CONTROL - LARGER THAN 1 ACRE

#### PART 1 - GENERAL

### 1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

#### 1.2 WORK INCLUDED

The General Contractor shall provide all labor, Α. materials, equipment and services necessary to: install; have a "trained contractor" (as defined in the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity) to control erosion and sediment resulting from construction operations, prevent flow of sediment from the construction site, contain construction materials (including excavation and backfill) within protected working areas. Work also includes performing daily inspections of; maintaining, installation, replacement and; removal (as necessary) the temporary and/or permanent erosion and sediment control measures as shown on the Drawings, contained within the Storm Water Pollution Prevention Plan (SWPPP) prepared for the project or as ordered by the "qualified inspector" (as defined in the General Permit), the Engineer, and/or the Engineer during the life of the Contract.

# B. Vegetative Measures

- 1. Topsoil
- 2. Seed and Mulch (Temporary and Permanent)
- 3. Mulch/Hydromulch
- 4. Hydroseeding
- C. Temporary Structural Measures
  - 1. Silt Fence

- 2. Hay Bales
- 3. Fiber Logs
- 4. Storm Drain Inlet Protection (Catch Basin Filters)
- 5. Sediment Trap
- 6. Stabilized Construction Entrance
- 7. Dust Control
- 8. Excavation Dewatering
- D. Permanent Measures
  - 1. Soil restoration
  - 2. Vegetated Swales
  - 3. Stabilized Erosion Control Fabric

#### 1.3 REFERENCES

- A. Erosion and Sediment Control Guidelines: Conform to the latest edition of "NEW YORK STATE STANDARDS and SPECIFICATIONS for EROSION and SEDIMENT CONTROL by NYS Department of Environmental Conservation (i.e., Bluebook). Refer to these guidelines for construction and maintenance of all items (Temporary and Permanent Structural, Vegetative and Biotechnical) included in the Storm Water Pollution and Prevention Plan (SWPPP).
- B. Storm Water Management: Conform to the latest edition of "NEW YORK STATE STORMWATER MANAGEMENT DESIGN MANUAL" prepared by Center for Watershed Protection for NYS Department of Environmental Conservation.

# 1.4 RELATED WORK

A. Section 02200 - Earthwork

# 1.5 TRAINED INDIVIDUAL

A. The Contractor shall employ a qualified individual suitably trained to oversee the erosion and sediment control measures in compliance with the SWPPP prepared for the project.

B. The Trained Individual shall be responsible for ensuring that the erosion and sediment control devices and measures are installed and maintained in compliance with the SWPPP prepare for the project.

# 1.6 QUALITY ASSURANCE

- A. The Contractor shall perform all operations in accordance with the rules, regulations and ordinances of those governing bodies having jurisdiction and the SWPPP prepared for the project.
- B. NYSDEC SPDES General Permit GP-0-20-001
  - 1. The project will be subject to the requirements of the New York State Department of Environmental Conservation (NYSDEC) SPDES General Permit for Stormwater Discharges from Construction Activity, Permit No. GP-0-20-001 or latest edition thereof. The Owner will file a Notice of Intent (NOI) with the NYSDEC in order to obtain coverage in accordance with the requirements of the General Permit.
  - 2. A Storm Water Pollution Prevention Plan (SWPPP) has been prepared in accordance with the requirements of the SPDES General Permit (refer to the pertinent Appendix attached to these Specifications). The SWPPP is a part of the Contract Documents and the Contractor shall conform to the SWPPP Section on Soil Erosion and Sediment Control, in addition to the requirements of this Specification.
  - 3. The Contractor(s) and Subcontractor(s) will be responsible for implementing all erosion and sediment control measures during construction. All contractors and subcontractors that will be performing excavations (soil disturbance) on the site must sign and return to the Owner and/or Engineer a copy of the certification statement provided in the SWPPP before undertaking any construction or activity at the site. The certification statement must include the name and title of the person providing the signature; the name, address and telephone number of the

contracting firm; the address (or other identifying description) of the site; description of specific SWPPP elements the company is responsible for; name and title of trained individual(s) responsible for SWPPP implementation; and the date the certification was made.

# Contractor Certification Statement

"I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified bv qualified inspector during a site inspection. I also understand that the owner or operator must comply with the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharges construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I am aware that there are significant penalties for submitting false information that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations"

- 4. Unless otherwise provided, the Contractor will obtain all permits and shall comply with applicable regulations of fish, wildlife and other agencies and all applicable, Federal, State and Local statutes relating to the prevention and abatement of soil erosion, sediment control, and water pollution. The Engineer shall request and receive assurance from the Contractor in writing that all applicable permits have been secured prior to beginning construction operations.
- 5. In the event of conflict between the requirements of these Project Specifications and the pollution control laws, rules or regulations of Federal, State or Local agencies, the more restrictive laws, rules or regulations shall govern.

6. In accordance with the requirements of the SPDES General Permit as noted in the SWPPP, the Contractor shall not disturb more than five (5) acres of soil at any one time unless prior written authorization has been received from the NYSDEC.

# C. Satisfactory Performance

Soil erosion, sediment control, and water pollution control measures shall at all times be satisfactory to the Engineer the "qualified inspector". When it becomes necessary, Engineer will inform the Contractor of unsatisfactory construction procedures operations. If the unsatisfactory construction procedures and operations are not corrected promptly, the Engineer may suspend the performance of any or all other construction until unsatisfactory condition has been corrected, and such suspension shall not be the basis of any by the Contractor for additional compensation from the Owner nor for an extension of time to complete the Work.

# 1.7 SUBMITTALS

- Prior to the start of the construction, the Contractor Α. shall submit to the Owner and Engineer the program and schedule for the accomplishment of temporary permanent erosion and sediment control work applicable during all phases of construction, and the plan for disposal of waste materials. Where erosion is likely to be a problem, clearing and grubbing operations shall be scheduled so that grading operations and erosion and sediment control features can follow immediately if the Project conditions thereafter, Otherwise, temporary erosion and sediment control be required between measures may successive construction stages. No Work shall be started until the erosion and sediment control schedule and methods of operations have been accepted by the Owner Engineer.
- B. The Contractor shall submit the following material designs for the type specified prior to materials being delivered to the site:

- 1. Silt Fence
- 2. Dust Control Material(s)
- 3. Temporary and Permanent Seeding Mixes (including Hydroseed mix)
- 4. Mulch/Hydromulch
- 5. Storm Drain Inlet Protection (Catch Basin Filters)
- 6. Filter Fabric for Stabilized Construction Entrance

#### 1.8 JOB CONDITIONS

- A. Protection of existing conditions as indicated in Section 02000 Site Work General Provisions of these Project Specifications shall apply to this Section.
- B. The Contractor shall provide all necessary safeguards as may be required to prevent damage to property beyond the Work area or adjacent property.
- C. Area of Work
  - 1. The Engineer shall have the authority to increase or decrease the surface area of erodible earth material exposed by clearing and grubbing, and/or excavation and fill operations associated with demolition or restoration from what is shown on the approved erosion and sediment control plans, and to direct the Contractor to provide immediate permanent or temporary erosion and sediment control measures to prevent contamination of adjacent streams or other watercourses, lakes, ponds or other areas of water impoundment.
  - 2. In general, the limit of the area of clearing and grubbing and/or excavation and fill operations associated with demolition or restoration in progress, shall be commensurate with the limit(s) of disturbance shown on the site grading and/or erosion and sediment control plans, as well as the Contractor's capability and progress in keeping the finished grade, mulching, seeding and other such temporary and/or permanent control measures current and in accordance with the accepted schedule. Temporary erosion and sediment control

measures shall immediately be provided by the Contractor should seasonal limitations make such coordination unrealistic, as determined by the Engineer.

- 3. Any encroachment outside the limits of work/disturbance shown on the approved Drawings as modified under Item 1 above shall be the Contractor's responsibility and they shall be responsible for all costs in repairing any damage caused by their operations.
- D. Temporary Erosion and Sediment Control Measures
  - 1. Temporary erosion and sediment control measures shall be used to correct conditions that develop during construction that are needed prior to installation of permanent control features, or that are temporarily needed to control erosion and sedimentation that develops during normal construction practices, but which are not associated with permanent control features on the Project.
- E. Permanent Erosion and Sediment Control Measures
  - 1. Where specified, the Contractor shall incorporate all permanent erosion and sediment control features into the Project at the earliest practical time as outlined in the Project Schedule.

#### PART 2 - PRODUCTS

#### 2.1 GENERAL

A. All materials shall be in accordance with the items specified on the Drawings and/or contained in the New York State Standards and Specifications for Erosion and Sediment Control dated August 2005 or latest edition thereof.

#### 2.2 SILT FENCE

A. Fence post shall be at least 36 inches long. Wood posts shall be of hardwood with a minimum cross section

area of 3 inches. Steel posts shall be standard "T" of "U" sections and should weigh no less than one (1) pound per linear foot.

B. Additional support shall be provided by a woven wire fence. Woven wire fence shall be at least 14-gauge with 2" x 4" openings. Plastic netting may be used in lieu of woven wire fence. The plastic netting shall be sewn on top of the geotextile filter fabric. Plastic netting shall have the following minimum properties:

Netting Property	Minimum Acceptable Value
Tensile Strength (lbs/ft)	185
Elongation (%)	11

C. The geotextile filter fabric shall have the following minimum material properties:

Geotextile Property	Minimum Acceptable Value	Test Method
Grab Tensile Strength (lbs)	90	ASTM D1682
Elongation at Failure (%)	50	ASTM D1682
Mullen Burst Strength (psi)	190	ASTM D3786
Puncture Strength (lbs)	40	ASTM D751(mod)
Slurry Flow Rate (gal/min/sf)	0.3	
Apparent Opening Size (AOS)	40-80	US Std Sieve CW- 02215
Ultraviolet Radiation Stability	90	ASTM G26

#### 2.3 STABILIZED CONSTRUCTION ENTRANCE

A. The geotextile filter fabric shall have the following minimum material properties:

Geotextile Property	Minimum Acceptable Value	Test Method
Grab Tensile Strength (lbs)	200	ASTM D1682
Elongation at Failure (%)	50	ASTM D1682
Mullen Burst Strength (psi)	190	ASTM D3786
Puncture Strength (lbs)	40	ASTM D751 (mod)
Apparent Opening Size (AOS)	40-80	US Std Sieve CW- 02215

B. Stone size shall crushed stone, coarse gravel, or reclaimed or recycled concrete equivalent conforming to AASHTO M-43, Size Designation No. 1 (nominal stone size 1-1/2 inches to 3-1/2 inches).

#### 2.4 DUST CONTROL

- A. Sprinkling site is sprinkled with water until the surface is wet.
- B. Tillage- to roughen surface and bring clods to the surface. This is a temporary emergency measure which should be used before soil blowing starts. Begin plowing on windward side of site. Chisel-type plows spaced about 12 inches apart, and spring-toothed harrows are examples of equipment which may produce the desired effect.
- C. Barriers solid board fences, snow fences, burlap fences, crate walls, bales of hay, and similar material can be used to control air currents and soil blowing.
- D. Stone shall be crushed stone or coarse gravel conforming to AASHTO M-43, Size No. 57.
- E. When permitted by the Owner or Engineer as an alternative to water sprinkling, spray adhesives for use on mineral soils shall be as specified in the Table below.

Material	Water Dilution	Type of Nozzle	Apply Gallons/Acre
7			·
Acrylic Polymer	7:1	Course	500
		Spray	
Latex Emulsion	12.5:1	Fine Spray	235
Resin in Water	4:1	Fine Spray	300
Acidulated soy	None	Course	1200
bean soap stick		Spray	

# 2.5 MULCH

# A. Mulch Materials:

Material	Quality Standard	Application Rate per 1,000 s.f.	Depth of application
Small	Air dried; free	90 to 100	Cover about
Grain Hay	of undesirable	lbs. (2-3	90% of
or Straw	seeds and coarse material	bales)	surface
Wood	Green or air	500 to 900	2"-7"
chips or	dried; free of	lbs	
Shavings	objectionable		
	coarse material		
Jute	Undyed,	48" x 50	
Twisted	unbleached plain	yards	
Yarn	weave. Warp 78	48" x 75	
	ends per yd. Weft	yards	
	41 ends per yd.		
	60-90 lbs/roll		
Gravel,	Washed:	9 cubic	3" - Use
crushed	AASHTO M-43, Size	yards	Size No. 3
stone or	No. 2.		where
slag	AASHTO M-43, Size		subject to
	No. 3.		traffic

1. Alternate mulch materials as described in the  $\underline{\text{New}}$  York State Standards and Specifications for Erosion and Sediment Control may be utilized with prior written approval of the Engineer.

# B. Mulch Anchoring

1. Mulch anchoring should be accomplished immediately after placement to minimize loss by wind or water. Anchoring may be done by one of the following

- methods, depending upon the size of the area, steepness of slopes, and costs.
- 2. Peg and Twine Drive 4 to 6 wooden pegs to within 2 to 3 inches of the soil surface every 3 feet in all directions (a 1 square yard block). Stakes may be driven before or after applying mulch. Secure mulch to soil surface by stretching twine between pegs in a criss-cross and a square pattern. Secure twine around each peg with two or more round turns.
- 3. Mulch Nettings Staple the light weight paper, jute, wood fiber, or plastic nettings to the soil surface according to manufacturer's recommendations. Mulch netting shall be biodegradable.
- 4. Crimper (mulch anchoring tool) A tractor-drawn implement, somewhat like a disc-harrow especially designed to push or cut some of the broadcast long fiber mulch 3 to 4 inches into the soil so as to anchor it and leave part standing upright. This technique is limited to areas traversable by a tractor, which must operate on the contour of slopes. Hay or straw mulch rate must be 2 tons (100-120 bales) per acre. No tackifying or adhesive agent is required.
- 5. Liquid Mulch-Binders (Tackifiers) May be used to anchor hay or straw mulches.
  - a. Applications should be heavier at edges where wind catches the mulch, in valleys, and at crests or banks. Avoid application during rain and at temperatures less than 45 degrees Fahrenheit.
  - b. Synthetic (polymeric) or Organic (gum) binders tackifiers such as Curasol, DCA-70, Petro-set and Terra-Tack, or equal, may be used at rates recommended by the manufacturer to anchor mulch materials. A 24-hour curing period is required.

#### 2.6 CONCRETE TRUCK WASHOUT

- A. The Concrete washout includes preparing foundation soil, furnishing and installing leveling pad, washout and removal and disposal of washout when full or construction activities are complete.
- B. The Washout consists of a reinforced, 10 oz. PVC, UV and water resistant, custom formed structure with pockets for holding L-Brackets and corners formed by the manufacturer.
- C. Material shall consist of native or imported soil. May also be level asphalt or concrete surface.
- D. The Tie Downs used shall be 1" x 6" U-Shaped Stakes.
- E. L-Bracket shall consist of #3 Rebar bent to conform to the washout liner. Quantity will depend on the washout size.
- F. After the Washout has been filled with washout residue, allow the water to evaporate leaving only solid concrete residue. Water can be pumped form the washout and disposed of a facility permitted to receive liquid waste.

#### 2.7 EROSION CONTROL FABRIC

- A. The Erosion Control Fabric shall be a permanent channel lining and turf reinforcement mat. The Erosion Control Fabric shall be a machine produced mat of 100% UV stabilized polypropylene.
- B. The Erosion Control Fabric shall have a consistent thickness of high denier polypropylene fiber evenly distributed over the entire area of the mat. The top surface of the mat shall be covered with UV stabilized black polypropylene netting having approximately a1/2-inch by 1/2-inch mesh size. The bottom surface of the mat shall be covered with UV stabilized black polypropylene netting having approximately a 5/8-inch by 5/8-inch mesh size. The blanket shall be sewn together on 2-inch centers (maximum) using polyester thread. The sewing shall secure the netting on each side of the mat to maintain the nets relative to the fiber core.

C. The Erosion Control Fabric shall have the following physical characteristics.

Fiber Matrix Minimum of 0.70 lb./sq. yd. of high denier UV stabilized polypropylenefiber.

Top Netting UV stabilized polypropylene netting with approximately 1/2-inch by 1/2-inch mesh size. Approximate weight 5.0 lbs/1,000 sq. ft.

Bottom Netting UV stabilized polypropylene netting with approximately 5/8-inch by 5/8-inch mesh size. Approximate weight 3.0 lbs/1,000 sq. ft.

Stitch 100% black polyester thread with a stitch spacing of no greater than 2.0 inches on center.

Roll Width 6.5 feet minimum. Roll Length No less than 80 feet.

- D. The Erosion Control Fabric shall be EroNet P300 as manufactured by North American Green, or approved equal.
- E. The Erosion Control Fabric shall be secured in place using heavy duty metal staples. The metal staples shall be U-shaped of the length shown on the Drawings, 1-1/2 inches wide and shall be fabricated from 9 gauge or greater diameter metal wire. The metal staples shall be furnished by the manufacturer of the erosion control fabric and shall be suitable for the installed product and consistent with the manufacturer's recommendations.

# 2.8 EROSION CONTROL BLANKET

- A. The Erosion Control Blanket shall be a temporary erosion control covering to protect the prepared seed bed from wind, precipitation and erosion, and allow for proper establishment of the vegetation. The Erosion Control Blanket shall be a machine produced mat of 70% agricultural straw and 30% coconut fiber.
- B. The Erosion Control Blanket shall have a consistent thickness with the straw and coconut mixture evenly

distributed over the entire area of the mat. The top surface of the mat shall be covered with UV stabilized, black polypropylene netting having approximately a 5/8-inch by 5/8-inch mesh size. The bottom surface of the mat shall be a lightweight, photodegradable netting with approximately 1/2-inch x 1/2-inch mesh size. The blanket shall be sewn together on 2 inch centers (maximum) using biodegradable thread. The sewing shall secure the netting on each side of the mat to maintain the nets relative to the straw/coconut fiber core.

C. The Erosion Control Blanket shall have the following physical characteristics:

Core Material 70% agricultural straw evenly distributed at 0.35 lbs/sq. yard., 30% coconut fiber evenly distributed at 0.15 lbs./sq. yard.

Bottom Netting Photodegradable netting with approximately 1/2-inch by 1/2-inch mesh size. Approximate weight 1.5 lb/1,000 sq. ft.

Top Netting UV stabilized polypropylene netting with approximately 5/8-inch by 5/8-inch mesh size. Approximate weight 3.0 lbs/ 1,000 sq. ft.

Stitch Biodegradable, with a stitch spacing no grater than 2.0 inches on center.

Roll Width 6.5 feet minimum. Roll Length No less than 80 feet.

- D. The Erosion Control Blanket shall be SC150 as manufactured by North American Green, or approved equal.
- E. The Erosion Control Blanket shall be secured in place using heavy duty metal staples. The metal staples shall be U-shaped of the lengths shown on the Drawings, 1 inch wide and shall be fabricated from 11-gauge or greater diameter metal wire. The metal staples shall be furnished by the manufacturer of the Erosion Control Blanket and shall be suitable for the installed product and consistent with the manufacturer's recommendations.

#### PART 3 - EXECUTION

#### 3.1 INSPECTION

A. Examine the areas and conditions where Erosion and Sediment Control Measures are to be installed and notify the Engineer of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected by the Contractor in a manner acceptable to the Engineer.

# 3.2 GENERAL REQUIREMENTS

- A. The Contractor shall conduct their operations in strict conformance with the approved SWPPP, Construction Schedule and Sequence, Drawings and these Project Specifications. The Contractor shall conduct their operations to minimize erosion of soils, to minimize the area of bare soil exposed at any one time, and to prevent silting and muddying of lands adjacent to or affected by the Work.
- B. Construction of drainage facilities and performance of other Work that will contribute to the control of erosion and sedimentation shall be carried out in conjunction with earthwork operations or as soon thereafter as practical.
- C. Where erosion is likely to be a problem, clearing and grubbing operations shall be scheduled so that grading operations and erosion and sediment control features can follow immediately thereafter, if the Project conditions permit. Otherwise, temporary erosion and sediment control measures may be required between successive construction stages.
- D. Throughout all operations covered by this Section, the Contractor shall provide all necessary measures to control dust through the use of water or other material in accordance with the approval of the Owner or Engineer, at such locations and during such periods as they may direct, or as may be required by Local Ordinance or Authorities.
- E. Upon completion of construction work and when permanent stabilization has been established, all temporary

structural soil erosion and sediment control devices/practices shall be removed by the Contractor to the satisfaction of the Owner and/or Engineer.

# 3.3 TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES

- A. Temporary erosion and sediment control measures shall be used to correct conditions that develop during construction that are needed prior to installation of permanent control features, or that are temporarily needed to control erosion and sedimentation that develops during normal construction practices, but which are not associated with permanent control features on the Project.
- B. The Contractor shall install all temporary sediment and erosion control measures in accordance with the SWPPP, Drawings, and Details and as described herein.

# 3.4 DUST CONTROL

- A. Throughout all operations covered by this Section of the Project Specifications, the Contractor shall provide all necessary measures to control dust through the use of water, resin-in-water emulsion or other material in accordance with the approval of the Owner or Engineer, at such locations and during such periods as they may direct, or as may be required by Local Ordinance or Authorities.
- B. Application of spray-on adhesive (resin-in-water emulsion) shall be applied at a rate of 300 gallons per acre. The resin-in-water emulsion shall be diluted at a ratio of 4:1 and shall be applied with a fine spray nozzle. The treated soil shall not be used for travel.
- C. Watering equipment shall consist of pipelines, tanks, tank trucks or other approved devices capable of applying a uniform spread of water over the surface. A suitable device for regulating the flow and positive shut-off of the water shall be provided for positive control by the operator.
- D. The Engineer will advise the Contractor of any unsatisfactory procedures for dust control. If the unsatisfactory procedures are not corrected promptly,

the Engineer may suspend the performance of any or all construction until the condition has been corrected.

#### 3.5 TEMPORARY SEEDING

- A. Fertilizer or lime shall not be used for temporary seeding.
- B. Annual ryegrass shall be applied at the rate of 30 lbs. per acre during the spring, summer and early fall. Certified 'Aroostook' winter rye (cereal rye) shall be applied at a rate of 100 lbs. per acre during late fall or early winter. Winter stabilization shall occur between October 31st and March 15th.
- C. Small grain straw mulch shall be applied at a rate of 90 lbs. per 1000 square foot or 2 tons per acre, to be applied and anchored according to the standards.
- D. In areas, including slopes and stockpiles, where soil disturbance activity has temporarily ceased and is not subject to construction traffic, the application of temporary seeding measures must be initiated by the end of the next business day and completed within 14 days from the date the soil disturbance activity ceased. If the season prevents the establishment of a temporary cover, the disturbed areas will be mulched with straw or equivalent material.

### 3.6 SEDIMENTS AND POLLUTANTS

- A. Water from operations containing sediment shall be treated by filtration, sediment traps or other approved means sufficient to reduce the sediment content to no more than that of the drainage system or receiving water into which it is discharged.
- B. Pollutants such as fuels, lubricants, bitumens, raw sewage, wash water or waste from concrete mixing operations, and other harmful materials shall not be discharged into or near rivers, streams, and impoundments or into natural or manmade channels leading thereto.

# 3.7 PERMANENT SEEDING AND OTHER EROSION AND SEDIMENT CONTROL MEASURES

- A. The Contractor shall incorporate permanent seeding erosion and sediment control features into the Project at the earliest practical time as outlined in their accepted schedule, as approved by the Engineer, and as specified in Section 02485, Grass Restoration.
- B. In areas where soil disturbance activity has permanently ceased and is not subject to further disturbance or construction traffic, the application of permanent seeding and other stabilization measures must be initiated by the end of the next business day and completed within 14 days from the date the soil disturbance activity ceased. Except where otherwise noted in the approved SWPPP or Drawings, final seeding and stabilization shall be applied in accordance with the "Standard and Specifications for Recreation Area Improvement" in the New York State Standards and Specifications for Erosion and Sediment Control.
- C. Alternative methods of permanent seeding or stabilization are not permitted unless approved by the Owner or Engineer.

#### 3.8 SOIL RESTORATION

- Soil shall be de-compacted in those areas subject to the use of heavy equipment and to restore the original properties of the soil by tilling (or rototilling) and soil amendment through the use of compost. This will reduce the generation of runoff due to construction activities and enhance the runoff reduction capacity of the soils. Soil restoration shall be applied during the cleanup and restoration phase of the project throughout all construction work areas. disturbed and compacted areas shall be restored in accordance with the Soil Restoration requirements in Table 5.3 of the DEC Design Manual. Soil restoration shall be accomplished during periods of relatively low to moderate subsoil moisture, the disturbed subsoils shall be returned to rough grade and the following steps shall be followed:
  - 1. Three (3) inches of compost shall be applied over the subsoil.

- 2. The compost layer shall be tilled into the subsoil to a depth of at least 12 inches using a cat-mounted ripper, tractor-mounted disc, or tiller, mixing, and circulating air and compost into subsoils. Tilling should not be performed within the drip line of any existing trees or over utility installations that are within 24 inches of the surface. The use of fertilizers will be minimized and shall be utilized only within existing commercial and/or residential lawn areas. Compost shall be aged, from plant derived materials, free of viable weed seeds, have no visible free water or dust produced when handling, pass through a half inch screen, and have a pH suitable to grow desired plants.
- 3. Rock-picking shall be performed until uplifted stone/rock materials of four inches and larger size have been cleared.
- 4. Topsoil shall be applied to a depth of 6 inches. Topsoil may be provided from stockpiled or offsite sources.
- 5. At the end of the project, the inspector should be able to push a 3/8" metal bar 12 inches into the soil just with body weight.
- 6. The seed mix utilized shall be as specified in Specification Section 02485, Grass Restoration.

#### 3.9 CONCRETE WASTE

A. Discharge of excess or waste concrete and/or wash water from Concrete Ready-Mix Trucks will be allowed on the construction site, but only in specifically designated diked areas that have been prepared to prevent contact between the concrete and/or wash water and storm water that will be discharged from the site or in locations where waste concrete can be placed into forms to make riprap or other useful concrete products. The cured residue from the concrete washout diked areas shall be disposed in accordance with applicable state and federal regulations. The jobsite superintendent is responsible for assuring that these procedures are followed.

# 3.10 TEMPORARY FUEL TANKS

A. Temporary on-site fuel tanks for construction vehicles shall meet all state and federal regulations. Tanks shall have approved spill containment with the capacity required by the applicable regulations. The tank shall be in sound condition free of rust or other damage which might compromise containment. Hoses, valves, fittings, caps, filler nozzles, and associated hardware shall be maintained in proper working condition at all times.

#### 3.11 SANITARY WASTE

A. A licensed sanitary waste management contractor, as required by local regulations, will collect all sanitary waste from on-site portable units.

++ END OF SECTION ++

#### SECTION 02429

#### DRAINAGE STRUCTURES

#### PART 1 - GENERAL

# 1.1 SUMMARY

A. Work included: Contractor shall furnish all labor, materials, equipment and incidentals necessary to provide, install and test all precast concrete drainage structures, catch basins, trench drains, manholes, yard drains, associated piping, check valves, and similar structures as shown, specified, and otherwise required to complete the Work

#### B. General

- 1. Structures shall conform in shape, size, dimensions, material, and other respects to the details shown on the Contract Drawings.
- 2. Pipe penetrations, inverts, shall conform to the details shown on the Contract Drawings. Side inverts shall be curved and main inverts, where direction changes, shall be laid out in smooth curves of the longest possible radius which is tangent to the centerlines of adjoining pipelines.
- C. Related Work Specified Elsewhere:
  - 1. Section 02200, Earthwork.
  - 2. Division 3.
  - 3. Division 15.
  - 4. Division 18.

## 1.2 SUBMITTALS

- A. Submit the following in accordance with Section 01300, "Submittals":
  - 1. Submit for approval samples of brick, block and accessories, if any, for the structures.

- 2. Submit for approval detailed drawings and data on pipe joints and specials.
- 3. Submit for approval Shop Drawings showing design and construction of all precast concrete and products including, but not limited to, the following:
  - a. Size and spacing of steel reinforcement.
  - b. Wall and slab thicknesses.
  - c. Concrete cover over steel reinforcement.
  - d. Joint design between component manhole sections, show all dimensions.
  - e. Concrete mix design including design compressive strength.
  - f. Catch basin frame dimensions.
  - g. Height of frame and leveling course.
  - h. Grade elevation at each catch basin.
  - i. Design of flexible seal assemblies and/or specified seal arrangement
  - j. Final grade elevation.
  - k. All pipe penetrations into manhole.
  - 1. Plan of base invert.
  - m. Certificates of compliance with referenced standards.
  - n. Certified test results.

#### 1.3 QUALITY ASSURANCE

#### A. General:

1. Comply with ANSI, OSHA, ASTM and all applicable Federal, State and local codes, including revisions to date of Contract.

- 2. Qualifications of manufacturer: Products used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the Engineer.
- 3. The Contractor shall give the Engineer 24 hours written notice plus travel time prior to the commencement of any manufacturing process or testing procedures for precast concrete products.
- 4. At the point of manufacture and after delivery to the site, the Engineer reserves the right to inspect and test all precast concrete products.
- 5. In addition, at the place of manufacture of precast concrete products, the Engineer reserves the right at all times:
  - a. To inspect the materials, the processes of manufacture, and the records of analysis and tests.
  - b. To select test specimens. 6. All precast concrete products delivered to the site shall be clearly marked at the factory with the date of manufacture and the manufacturer's identification. Omission of this information may be cause for rejection of the catch basin.
- B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
  - 1. ASTM C 32, Sewer and Manhole Brick (made from clay or shale).
  - 2. ASTM C 139, Concrete Masonry Units for Construction of Catch Basins and Manholes.
  - 3. ASTM C 140, Sampling and Testing Concrete Masonry Units.
  - 4. ASTM C 207, Hydrated Lime for Masonry Purposes.

- 5. ASTM C 478, Precast Reinforced Concrete Manhole Sections.
- 6. ASTM C 923, Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.
- 7. ASTM D 543, Test for Resistance of Plastics to Chemical Reagents.
- 8. ASTM D 1248, Specification for Polyethylene Plastics Molding and Extrusion Materials.

# C. Manufacturer's Testing

- 1. Tests on reinforced concrete manhole components shall be in accordance with the "Physical Requirements" section of ASTM C 478.
- 2. The Contractor shall ensure that the manufacturer furnishing manholes under these Specifications shall be fully equipped with testing facilities of the approved type and capacity. The Contractor shall furnish the required number of specimens of manhole components at no additional cost to the County.

# 3. Absorption Test

- a. For every 100 manhole bases and manhole riser sections manufactured, one specimen shall be selected for an absorption test. As a minimum, one specimen representing a manhole base and manhole riser section shall be tested. The absorption test shall be performed in accordance with the requirements of ASTM C 478.
- b. In the event any specimen fails to meet any of the requirements of the absorption test, then two additional test specimens shall be selected for each specimen that failed, from the lot represented by the specimen that failed. The additional specimens shall be tested; and should any one of these fail to meet the requirements specified, the entire lot represented by these tests shall be rejected.

# 4. Compression Test

For each of the four manhole components made of precast and cast-in-place concrete (manhole base, manhole riser section, transition slab and top slab) compression tests shall be made standard rodded concrete cylinders. minimum of four concrete cylinders shall be for each day's production molded particular manhole component. Each cylinder representing a particular manhole component shall be molded from the same concrete batch utilized for the manufacture of the component. The concrete cylinders shall be tested in accordance with the specifications of ASTM C 478 except for the required strengths of the cylinders, which shall be as follows:

The strength of precast concrete shall be considered satisfactory if both of the following requirements are met:

- 1) The average at 28 days of three consecutive strength tests equals or exceeds 4000 psi.
- 2) No individual strength test falls below required strength by more than five hundred psi. b. In the event a concrete cylinder's compressive strength is unsatisfactory the manufacturer shall select one of the following two options:
  - a) The entire day's production of the manhole component represented by the test cylinder shall be rejected.
  - b) The manufacturer shall have the option to drill two cores from manhole components represented by the unsatisfactory test cylinder and perform compression tests on the cores. The manhole component sampled shall be selected by the Engineer. Should the compression tests on these core samples meet the

strength requirements as specified in this Section, the Engineer shall determine the acceptability of all manhole components represented by the test, considering the results of the tests on the concrete cylinders as well. Based on the Engineer's evaluation, if the compression test for the cores is determined to be unacceptable the entire day's production of the manhole component represented by the core sample shall be rejected. The Engineer's decision shall be considered final.

# 5. Top and Transition Slabs

- a. In lieu of a proof of design test for the top and transition slabs the Contractor shall submit in the Shop Drawings top slab and transition slab design calculations and Drawings for approval by the Engineer.
- b. The design calculations shall be in accordance with requirements specified in this Section.

# 1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Drainage Structure components shall not be shipped until the 28-day strength is reached.
- B. Handle all manhole components carefully with approved handling devices. Drainage Structure components shall be kept completely free from dirt and foreign matter.
- C. Drainage Structure components with damaged "O" ring or sealing grooves will not be approved.
- D. Contractor shall clearly mark and immediately remove all damaged Drainage Structure components.
- E. Certified copies of all test results shall accompany each Drainage Structure component shipment and shall be furnished to the ENGINEER with each shipment.

#### PART 2 - PRODUCTS

#### 2.1 PRECAST PRODUCTS

- A. Where shown or otherwise approved by the Engineer, precast concrete shall be used for items such as drainage structure Layout and details shall be as shown and specified. Design shall be adequate to withstand all loads imposed including earth pressure, vehicle loads and construction loading.
- B. Catch basins, leaching pools and other structures shall be of sufficient strength to safely support an AASHTO H-20 loading. All steel reinforcement shall meet the requirements of ASTM C 478, ASTM A 615, ASTM A 82 and ASTM A 185. All concrete shall meet the requirements of Section 03300, Cast-in-Place concrete and reinforcement meet with requirements of 03210, Reinforcing Steel.
- C. Catch basins shall be provided with openings at the proper locations and elevations for all pipe connections. The space around each pipe connection shall be sealed with mortar.
- D. Unless shown otherwise on the Drawings, joints for all precast concrete manhole components shall be of the bell and spigot type with a round "0" ring rubber gasket meeting the requirement of ASTM C443, or a preformed plastic sealing compound as specified in the Federal Specifications SS-S-210A. Joints shall be formed so that adjacent manhole sections will fit and seal properly.
- E. All lifting holes shall be sealed tight with a solid rubber plug driven into the holes and the remaining void filled with 1 to 2 cement-sand mortar.

#### 2.2 CASTINGS

- A. General: All frames and covers (standard and oversize) unless otherwise shown or required, shall be watertight. All frames shall be of the nonadjustable type, with frames suitable for installation over drainage structures.
- B. Terminal or Flush: covers equipped with vent holes shall be installed on all terminal or flush type manholes (not applicable).

- C. Castings shall be as specified in Section 05540, Castings.
- D. Sizes shall be as shown on the Contract Drawings.

# 2.3 PIPE CONNECTORS

- A. Connectors shall consist of a PVC hub, rubber sleeve and stainless steel band.
- B. Connection shall be a compression fit into the cored wall of a mainline pipe.
- C. Hub shall be made from heavy-duty PVC material. Stainless steel clamping assembly shall be made from minimum 301 grade steel.
- D. Rubber sleeve and gasket, when applicable, shall meet the requirements of ASTM F477. Gaskets shall be installed by the manufacturer. The water-based solution provided by the manufactures shall be used during assembly. Pipe lube shall not be used.
- E. Water tight bell connection shall be included that meets the requirements of ASTM D3212.
- F. Approved Manufactures
  - 1. InsertaTee Co. ph: 503.357.2110 fax: 503.359.5417
     insertatee.com
  - 2. Or approved equal.

# 2.4 PIPE CONNECTORS (ALTERNATE)

- A. Each manhole base shall be provided with circular or slotted openings at the required locations and elevations for the proper connection of all pipes. The circular pipe connections shall be sealed with a flexible modular seal assembly; slotted openings shall be sealed with non-shrink grout.
- B. The flexible modular seal assembly shall be installed in accordance with the recommendations of the seal assembly manufacturer. Flexible modular seal assemblies shall

maintain a watertight connection. The flexible modular seal assembly shall be manufactured by:

- 1. Kor-N-Seal (Dukor Co., Milford N.H.).
- 2. Or equal.
- C. When a non-shrink grout is used to seal the pipe connection, the concrete bonding agent and non-shrink grout used to seal the pipe connections in the slotted manhole base section openings shall be in accordance with Section 03300.
- D. The existing pipe within the slotted base shall be saw cut and removed as shown on the Drawings after grouting the pipe penetrations into the base section.

#### 2.5 CONCRETE

A. Concrete shall conform to the requirements of Section 03300, Concrete.

#### 2.6 BRICK MASONRY

- A. Brick: All brick used as specified under this Section shall meet the requirements stated in ASTM C32.
- B. Mortar and Plaster: All mortar and plaster required to complete brick masonry as shown on the Drawings or as specified herein complying with Section 04200, Mortar.

#### 2.7 STEEL REINFORCEMENT

A. Steel reinforcement shall be placed in all concrete structure components as shown on the Drawings and as specified herein. The reinforcing shown on the Drawings is the minimum amount required. All steel reinforcement shall meet the requirements specified in Section 03200, Reinforcing Steel.

## 2.8 TOP SLABS AND TRANSITION SLABS

A. Each top slab placed on the top of the riser sections shall be manufactured in accordance with the Drawings and as specified herein.

- B. Concrete slab thicknesses shall not be less than the dimensions shown on the Drawings.
- C. Each top slab and transition slab shall be of acceptable design and of sufficient strength to safely support an AASHTO H-20 loading.

#### 2.9 BASES AND RISER SECTIONS

- A. The minimum diameter for each base shall be as shown on the Drawings.
- B. Base sections minimum slab and wall thicknesses shall be as shown on the Drawings.
- C. Base sections slotted to fit over existing sewer pipes shall be installed on cast in place base slab as shown on Drawings
- D. Bases shall be cast monolithically to at least 12 inches above the top of the highest pipe entering the manhole.
- E. Riser sections shall have a minimum wall thickness of 6 inches and the same internal diameter as the manhole base (unless otherwise shown).
- F. Riser sections shall be constructed of various lengths to provide the correct height with the fewest joints. No pipe penetrations shall be located at a joint.
- G. The steps shall be built into the precast manhole sections by the manufacturer. The steps shall be R-1982, or approved equal. The embedded portion of the steps is to be bituminous coated. Steps shall be installed 12" on center and be aligned with the opening. All steps shall have a minimum 5-inch projection into the structure.

#### 2.10 PAINTING AND WATERPROOFING

A. All castings shall be thoroughly cleaned and free from rust. All drainage structures shall be waterproofed on the outside with two coats of bituminous coal tar coating as manufactured by Sherwin Williams, or Equal.

## 2.11 YARD DRAINS

- A. PVC surface drainage inlets shall include the drain basin type as indicated on the contract drawing and referenced within the contract specifications. The ductile\_iron grates for each of these fittings are to be considered an integral part of the surface drainage inlet and shall be furnished by the same manufacturer. The surface drainage inlets shall be as manufactured by Nyloplast a division of Advanced Drainage Systems, Inc., or prior approved equal.
- В. The drain basins required for this contract shall be manufactured from PVC pipe stock, utilizing a thermoforming process to reform the pipe stock to the specified configuration. The drainage pipe connection stubs shall be manufactured from PVC pipe stock and formed to provide a watertight connection with the specified pipe system. This joint tightness shall conform to ASTM D3212 for joints for drain and sewer plastic pipe using flexible elastomeric seals. flexible elastomeric seals shall conform to ASTM F477. The pipe bell spigot shall be joined to the main body of the drain basin or catch basin. The raw material used to manufacture the pipe stock that is used to manufacture the main body and pipe stubs of the surface drainage inlets shall conform to ASTM D1784 cell class 12454.
- C. The grates and frames furnished for all surface drainage inlets shall be ductile iron for structure size 12"," and shall be made specifically for each basin so as to provide a round bottom flange that closely matches the diameter of the surface drainage inlet. Grates for drain basins shall be capable of supporting various wheel loads as specified by Nyloplast. 12" and 15" square grates will be hinged to the frame using pins. Ductile iron used in the manufacture of the castings shall conform to ASTM A536 grade 70-50-05. Grates and covers shall be provided painted black.

#### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. All excavation, shoring and dewatering required for the construction of drainage structures shall be performed in accordance with Section 02200, Earthwork.
- B. Excavation shall be to the required depth. Over-excavated areas shall be backfilled with select fill material properly compacted as specified in Section 02200, Earthwork.
- C. Shoring: Shoring of all excavations shall be provided as specified in Section 02200, Earthwork.
- D. Dewatering: All dewatering shall be performed as specified in Section 02250, Dewatering.

## 3.2 INSTALLATION OF PRECAST PRODUCTS

- A. General: Install the work of this section in strict accordance with the approved Shop Drawings and manufacturer guidelines.
- B. Set drainage structures at the proper elevation with proper bearing on a suitable foundation. Catch basins shall be level and oriented to receive all incoming and outgoing pipes.
- C. Brick stacks shall be used for all precast structures where required. They shall be a maximum of 12 inches in height, constructed on the top surface on which the frame will be placed. The brick stack shall bring the frame to the proper grade.
- D. Brick shall be satisfactorily wet when being laid and each brick shall be laid in mortar so as to form full bed, end and side joints in one operation. The joints shall not be wider than 3/8-inch, except when the bricks are laid radially, in which case the narrowest part of the joint shall not exceed 1/4-inch.
- E. An approved watertight joint shall be provided for each pipe entering and exiting each catch basin.

## 3.3 INSTALLATION OF PIPE CONNECTORS

- A. Installation shall be in accordance with manufacture's recommended installation guidelines.
- B. Backfill around the connector shall be of the same material type and compaction level as specified for the pipe installation.

#### 3.4 WATER TIGHTNESS:

- A. All shall be free of visible leakage. Each shall be tested and inspected for leaks, and all leaks shall be repaired in a manner subject to the Engineer's approval.
- B. All structures shall be tested for leakage by filling the structures with water and observing the drop in the water surface elevation for a period of 24-hours. Allowable leakage per 24 hours shall not exceed 0.3 gallons per foot diameter per foot depth.
- C. Alternative to a water test, Vacuum testing in compliance with ASTM standards is also acceptable.

## 3.5 BRICK MASONRY:

- A. Brick masonry may be utilized to close up openings in manhole walls where existing pipes have been removed during construction. Installation of bricked up openings shall not interrupt maintenance of sewage flow.
- B. Brick shall be satisfactorily wet when being laid and each brick shall be laid in mortar so as to form full bed, end and side joints in one operation. The joints shall not be wider than 3/8-inch.
- D. Following the placement of the brickwork, a one half inch layer of cement mortar shall be applied to the exterior surface of the brick and troweled to a smooth finish. G. Lids for Manholes: 1. Installation shall be as shown on the Contract Drawings.

## 3.6 YARD DRAINS:

A. The specified PVC surface drainage inlet shall be installed using conventional flexible pipe backfill materials and procedures. The backfill material shall

be crushed stone or other granular material meeting the requirements of class 1, class 2, or class 3 material as defined in ASTM D2321. Bedding and backfill for surface drainage inlets shall be well placed and compacted uniformly in accordance with ASTM D2321. The drain basin body will be cut at the time of the final grade. No brick, stone or concrete block will be required to set the grate to the final grade height. For load rated installations, a concrete slab shall be poured under and around the grate and frame. The concrete slab must be designed taking into consideration local soil conditions, traffic loading, and other applicable design factors. For other installation considerations such as migration of fines, ground water, and soft foundations refer to ASTM D2321 guidelines.

+ + END OF SECTION + +

#### SECTION 02440

#### THERMOPLASTIC PIPE

## PART 1 - GENERAL

#### 1.1 DESCRIPTION

## A. Scope:

- 1. The General Contractor shall furnish all labor, materials, equipment and incidentals as shown on the Contract Drawings, specified and required to provide PVC sewer pipe, fittings and specials necessary to complete the Work.
- 2. The extent of the piping Work is shown on the Contract Drawings.
- 3. Work shall include but not be limited to: the excavation for the pipe trench including the removal of masonry and boulders; the stockpiling of all suitable excavated material; the disposal of excess materials; bracing, sheeting and dewatering, the furnishing and laying of the pipe and house connection tees or wyes; the removal and disposal of existing pipe; the backfilling of the pipe trenches; tests for deflection; the location and protection of utilities and structures; protection, removal and reinstallation of fences and landscaping; and all other work required for the complete installation of the sewers subject to acceptance, exclusive of the work specified under separate items.
- 4. Concrete cradle shall be required under all pipe couplings and adapters.

# B. Related Work Specified Elsewhere:

- 1. Section 02200, Earthwork.
- 2. Section 02674, Corrugated High Density Polyethylene Pipe (HDPE)
- 3. Section 18051, Buried Pipe Installation.

# 1.2 QUALITY ASSURANCE

- A. Source Quality Control: Obtain pipe and fittings from one manufacturer.
- B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
  - 1. ASTM D 1598, Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure.
  - 2. ASTM D 1599, Test Method for Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing and Fittings.
  - 3. ASTM D 1784, Rigid Poly (Vinyl Chloride) PVC Compounds and Chlorinated Poly (Vinyl Chloride) CPVC Compounds.
  - 4. ASTM D 1785, Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120.
  - 5. ASTM D 2122, Determining Dimensions of Thermoplastic Pipe and Fittings.
  - 6. ASTM D 2467, Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
  - 7. ASTM D 2564, Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
  - 8. ASTM D 2774, Underground Installation of Thermoplastic Pressure Piping.
  - 9. ASTM D 2846, Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems.
  - 10. ASTM F 437, Threaded Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
  - 11. ASTM F 439, Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.

- 12. ASTM F 441, Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.
- 13. ASTM F 493, Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
- 14. ASTM F 1668, Construction Procedures for Buried Plastic Pipe.
- 15. ASTM D 2321-05, Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
- 16. Standard No. 14, National Sanitation Foundation.
- 17. American National Standards Institute.
- 18. ASTM D 3034, Sanitary Piping
- 19. ASTM F 477, Rubber Gaskets

## 1.3 SUBMITTALS

- A. Shop Drawings: Submit for approval Shop Drawings showing the following:
  - 1. Catalog Data consisting of specifications, illustrations and a parts schedule that identifies the materials to be used for the various piping components and accessories. The illustrations shall be of sufficient detail to serve as a guide for assembly and disassembly.
  - 2. Complete layout and installation drawings with clearly marked dimensions. Piece numbers which are coordinated with the tabulated pipe layout schedule shall be clearly marked. Scale and size of the drawings shall conform to the specifications in the General Conditions.
- B. Tests: Submit description of proposed testing methods, procedures and apparatus. Submit copies of all test reports.
- C. Certificates: Submit certificates of compliance with referenced standards.

D. Record Drawings: Submit in accordance with the requirements of the Specification.

## 1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Handle all pipe, fittings and accessories carefully with approved handling devices. Do not drop or roll pipe off trucks. Do not otherwise drop, roll or skid pipe. Materials that are cracked, chipped, gouged, dented or otherwise damaged will not be approved.
- B. Store pipe and fittings on heavy wood blocking or platforms so they are not in contact with the ground.
- C. Pipe, fittings and specials shall be unloaded as close to the place where they are to be laid as is practical, at a location which has been approved by the Engineer. Interiors shall be kept completely free from dirt and foreign matter.
- D. No material furnished under this specification shall be shipped to the job site until all submittals have been approved.

# PART 2 - PRODUCTS

# 2.1 MATERIALS

## A. General:

- Joints shall be as specified. If not specified, use push-on joint for buried piping.
- 2. Pipe Marking:
  - a. Class designation shall be cast or painted on each piece of pipe and fitting.
  - b. Each piece of pipe and fitting shall be clearly marked with a designation which shall conform with designations shown on the Shop Drawings.
- B. Gravity Sewer Pipe (size as indicated) and Roof/Site Drainage (6-inch diameter and less):

- 1. PVC SDR 26 and PVC SDR 35 Pipe:
  - a. Polyvinyl chloride pipe shall be made from Class 12454-B materials or better in accordance with ANSI/ASTM D1784. Pipe and fittings shall have an SDR classification of 35. PVC pipe and accessories shall conform to the requirements of the following with a minimum pipe stiffness of 46 psi at a maximum deflection of 5%:

ANSI/ASTM D 3034 (4 inches - 15 inches) ANSI/ASTM F 679 (18 inches - 27 inches)

- b. Polyvinyl chloride fittings and coupling shall conform to the requirements of the PVC pipe for classification and size. Rubber gaskets for elastomeric joints shall conform to ANSI/ASTM F477. Lubricant for the joints shall be furnished by the pipe manufacturer. The rubber gaskets shall be factory installed in the bell of the pie, fittings and couplings. The plain end of the pipe shall be marked by the manufacturer to show the depth of penetration into the bell or coupling.
- c. PVC pipe shall be Fluid-Tite gravity sewer pipe as manufactured by CertainTeed Corp., IPEX, or equal.
- C. Storm Sewer Piping (size as indicated):
  - 1. Corrugated High Density Polyethylene Pipe (HDPE)
    - a. Refer to Section 02674
- D. Transitions from One Type of Pipe to Another:
  - 1. Provide all necessary adapters, specials and connection pieces required when connecting different types and sizes of pipe or connecting pipe made by different manufacturers.
  - 2. Where new pipe is to be connected to existing pipe, the existing pipe shall be cut straight and smooth. The two pipes shall be joined with a flexible neoprene boot with stainless steel compression

straps and hardware. This boot shall be manufactured by Fernco, or approved equal. Contractor shall verify type, size and class of existing sewer where replacement pipe is being installed and order the appropriate "Fernco Coupling" as necessary. Be advised that standard style couplings will not be permitted to be installed on sewers of different materials, class or size.

- E. Restraints, Supports and Thrust Blocks:
  - 1. Provide concrete and metal cradles, collars, kickers, and blocks as shown or otherwise required and approved by Engineer.

#### 2.2 IDENTIFICATION

- A. All pipeline material shall be stamped, marked or identified with the following:
  - 1. Name of manufacturer.
  - 2. Pipe size.
  - 3. Pipe material.
  - 4. Wall thickness.
  - 5. Rating.

## PART 3 - EXECUTION

## 3.1 EXCAVATION/TEMPORARY SHEETING

- A. Excavation:
  - Prior to performing any excavation, the Contractor shall obtain road opening permits from all County, Town, Village and any other municipal agencies on whose property excavation is taking place.
  - 2. The ownership of the road and parking lot where excavation is taking place is as follows:
    - a. Town of Blooming Grove.

- 3. The Contractor shall make, in open cut or as otherwise permitted or required, to the widths and depths necessary for proper construction, all earth excavation required for this Contract. They shall excavate any other material which in the opinion of the Engineer is required for any purpose pertinent to the construction of the work. The Contractor is prohibited from using pavement breakers to remove road pavement. They shall saw cut, jack hammer, or use other methods which meet the approval of the Engineer.
- 4. In excavating trenches, where different strata of soil are encountered, some of which are suitable and some unsuitable for backfill, the Contractor shall use the suitable material for backfill and dispose of the unsuitable.
- 5. The word "earth" as used herein shall include all materials except concrete and concrete base pavements. The removal of all bituminous pavements, concrete sidewalks, driveways and curbs is classified as "earth excavation."
- 6. The Contractor shall remove and reinstall fences, stone retaining walls, etc. located within the areas to be excavated.
- 7. The Contractor shall support existing sanitary force mains, water mains, telephone ducts, electrical ducts, gas mains, manholes, overhead electric lines and poles, and other pipe lines and conduits located within the areas to be excavated.
- 8. Unsuitable material below the limits of excavation shown on the Drawings or as ordered by the Engineer shall be removed for the full width of the trench. The excavated area shall be backfilled with select fill.

## B. Temporary Sheeting and Bracing

1. The Contractor shall furnish, install and remove all sheeting and bracing required to construct the work, protect adjacent utilities and structures, and maintain the trench to a maximum width as indicated in the Contract Drawings. Sheeting shall

be used as required for the safety of employees exposed to the hazard of falling or sliding material for any trench or other excavation more than 5 feet above the employees' footing. Sheeting shall be adequate and conform to the provisions of the current Industrial Code Rule 23 as established by the New York State Department of Labor, Board of Standards and Appeals and current OSHA regulations. These requirements are the minimum and may have to be increased depending on the hazard. All sheeting and bracing shall be sufficiently strong and so placed that it will readily withstand all pressures it may be subjected to.

- 2. The Contractor shall be responsible at all times for carrying out all excavation operations in a safe and prudent manner so that the workmen and the public will be protected from unreasonable hazard. All applicable local and state requirements shall be observed and necessary permits acquired by the Contractor at their own expense.
- Trenches shall be adequately shored or tight 3. sheeted and securely braced where conditions require it. Sheeting shall be placed and braced so as to present and maintain a plane surface free from bulges and sufficiently tight to prevent any of the surrounding material into excavation. Tight sheeting will be required where it is necessary to prevent groundwater from penetrating into the excavation and to protect structures such as, but not limited to, buildings, rigid pavements, drains, sewers and wherever directed by the Engineer. Where tight sheeting is required, it shall be adequate to prevent the undermining of the structure it is to protect. Sheeting shall be driven in advance of the excavation so as to maintain the lower end of the sheeting at least 12 inches below the excavation down to a point below the pipe invert or bottom of gravel foundation, bottom of cradle, encasement or structure. The lower 3 inches of excavation shall be done by hand so as to insure an accurate, undisturbed foundation for the pipe.
- 4. The Contractor is solely responsible for selecting and using the proper type of sheeting and bracing required to perform the work. This includes the

- sheeting material, as well as the method of installing the sheeting.
- 5. The Contractor's attention is directed to the fact that heavy trucks carrying such items as refuse, concrete, asphalt and construction materials and heavy construction equipment may pass in close proximity to the trench. The Contractor shall install adequate sheeting and bracing to withstand these loads.
- 6. Where it is necessary to remove overhead wiring and fixtures to drive sheeting or perform excavation to perform the new work, the Contractor shall do so in accordance with the requirements of the road or utility owner and put in place, a temporary system, all at no additional cost to the Owner.
- 7. The Contractor shall take all necessary precautions during the installation of the temporary sheeting to prevent damaging the existing sewer pipe and the existing house connection piping that is connected to the sewer main. The existing house connection piping is typically located 90-degrees to the sewer main and the temporary sheeting installation shall take this into account.
- 8. All payment for sheeting and bracing required to perform the work shall be included in the price bid for furnishing and installing pipe.

#### 3.2 INSTALLATION

#### A. General:

- 1. Install piping as shown on the Contract Drawings, specified and as recommended by the manufacturer.
- 2. Request direction/clarification from Engineer before proceeding if there is a conflict between the manufacturer's recommendations and the Contract Drawings or Specifications.
- 3. Pipe, fittings and accessories that are cracked, damaged or in poor condition will be rejected at the time of laying, the pipe shall be examined carefully for defects, and should any pipe be discovered to be defective after being laid, it

- shall be removed and replaced with sound pipe by the Contractor at their expense.
- 4. For specially fabricated piping, the Contractor shall provide the services of a competent manufacturer's installation specialist when pipe installation begins, unless otherwise approved by Engineer.
- 5. Conflicts between piping systems and equipment or structures shall be presented to the Engineer for determination of corrective measures before proceeding.
- 6. Minimum cover over PVC drainage piping shall be two (2) feet unless otherwise shown or approved by the Engineer.
- 7. Earthwork required is specified in Section 02200, Earthwork.

# B. Piping:

- 1. Install straight runs true to line and elevation.
- 2. Provide temporary caps or plugs over all pipe openings at the end of each days work and when otherwise required or directed by Engineer.
- 3. Cutting: Cut pipe from measurements taken at site, not from Drawings.
- 4. Bed pipe with materials as specified below and as shown on the Contract Drawings.
  - a. Trenches shall be excavated below the pipe bottom by an amount sufficient for the placement of non-frost susceptible fill for pipe bedding as shown on the drawings or as specified. All loose and unsuitable material shall be removed from the trench bottom.
  - b. Non-frost Susceptible Fill shall be placed in accordance with the requirements of Section 02200, Earthwork, within the following limits:
    - 1) Six (6) inches below the bottom of the pipe to twelve (12) inches above the

crown of the pipe. Utility markout tape shall be installed in trench 12-inches above the pipe.

- c. Select Fill / General Fill shall be placed in maximum 12-inch layers above the crown of the pipe and compacted for the full width of the trench. Recesses in the embedment shall be provided around each joint to allow space for making joints and inspection.
- 5. Carefully and thoroughly compact all pipe bedding and fill.
- 6. No piping shall be laid until Engineer approves the bedding condition.
- 7. No pipe shall be brought into position until the preceding length has been bedded and secured in its final position.
- 8. All trenches and excavation shall be backfilled to the original surface of the ground or to such other grades as may be shown or directed.
- 9. All backfilling shall be carried along as speedily as possible. As soon as the mortar and masonry are sufficiently set and required tests are completed, backfill shall proceed immediately.
- 10. In all backfilling of trenches and around structures, all loose lumber, braces, rubbish and refuse shall be removed from the space to be backfilled and no such materials will be permitted in the backfill.
- 11. All backfilling, unless otherwise specified, shall be done with sound material, free from waste, objectionable organic matter, rubbish or other unsuitable materials. In general, the Contractor shall utilize all suitable excess material available from the contract work for fill, where required. No frozen material containing lumps over 6 inches in the largest dimensions shall be used for backfilling. Only fine granular material shall be used for backfilling to a depth of at least 2 feet above the top of the pipe. Unsuitable

- material, as determined by the Engineer, shall be replaced with select fill as ordered.
- 12. Backfill shall be solidly compacted by mechanical tamping or other approved methods as the work progresses. Where stones occur in backfill, they shall be distributed throughout the mass so that all interstices are solidly filled with fine material.
- 13. The fine granular material required for backfilling to a depth of at least 2 feet over the tops of sewer pipes shall be of suitable quality, free from stones, pieces of masonry and refuse, deposited on all sides, wetted until moist and solidly tamped in 6-inch layers in such a manner as to avoid injuring the piping or structures, or producing unequal pressure thereon. Special attention shall be paid to the compaction of backfill up to the spring line of the pipe by hand or mechanical tampers.
- 14. Compacting of the backfill material shall be mechanical tamping or other suitable methods. Jetting will not be allowed. Compaction shall be performed in maximum 6-inch lifts.
- 15. In backfilling around structures other than pipe, the material used shall be granular in character, and shall be compacted in a manner similar to that used in compacting backfill in trenches.
- 16. All compaction procedures shall achieve a minimum compaction density of 95% of Standard Proctor Maximum Density. At minimum, one test shall be taken per manhole location and one test per 50 lineal feet of pipe installed. The Contractor shall employ a testing laboratory, approved by the Engineer, to perform these tests. All costs shall be borne by the Contractor.
- 17. When sheeting is withdrawn, all cavities in or adjoining the trench shall be solidly filled and compacted. Sheeting shall be withdrawn as backfill operations are being performed. When sheeting is left in place, all cavities behind the sheeting shall be solidly filled and compacted.

18. The maximum size of broken stone or rock permitted in the backfill will be 4 inches in diameter, except where permitted by the Engineer. In no case may stones rest against the pipe.

## C. Laying Pipe:

- 1. Conform to manufacturer's instructions and to AWWA C600, AWWA M9, AWWA M11, AWWA M23 where applicable.
- 2. Install all pipe accurately to line and grade shown unless otherwise approved by Engineer. Remove and relay pipes that are not laid correctly.
- 3. Slope piping uniformly between elevations given.
- 4. Ensure that water level in trench is at least 12 inches below bottom of pipe. Do not lay pipe in water. Maintain dry trench until jointing and backfilling are complete.
- 5. Start laying pipe at lowest point and proceed towards the higher elevations, unless otherwise approved by Engineer.
- 6. Place bell and spigot pipe so that bells face upstream unless otherwise approved by Engineer.
- 7. Excavate around joints in bedding and lay pipe so that only the barrel receives bearing pressure from the trench bottom.
- 8. Permissible deflections at joints shall not exceed 75 percent of the amount allowed by manufacturer.
- 9. Prior to laying pipe, every precaution shall be taken to ensure that no foreign material enters the piping.
- 10. All pipe and fittings shall be carefully examined for cracks, damage or other defects while suspended above the trench, before installation. Defective materials shall be immediately removed from site.
- 11. Interior of all pipe and fittings shall be inspected and all dirt, gravel, sand, debris or other foreign material shall be completely removed

from pipe interior before it is moved into the trench.

- 12. Field cutting pipe, where required, shall be made with a machine specially designed for cutting piping. Cuts shall be carefully done, without damage to pipe or lining, so as to leave a smooth end at right angles to the axis of pipe. Cut ends shall be tapered and sharp edges filed off smooth. Flame cutting will not be allowed.
- 13. Blocking under piping shall not be permitted unless specifically accepted by Engineer for special conditions.
- Where connecting new pipe to existing manholes, the demolition of existing manhole walls shall be done in a neat, workmanlike manner, and limited in size to the minimum necessary to remove the existing pipe and install the new sewer pipe. Grout shall be nonshrink type with 1/4-inch overlay of polyester patching system such as Quick-Rok manufactured by Fosroc, Sikadur Le Mod Gel Mortar 1:1 Gel/Sand manufactured by Sika, or equal. After the new pipes are in place and grouted, the molded concrete invert fill shall then be replaced as required, true to the sewer pipe invert elevations, and shall be well shaped to smoothly channel the flow into the outlet pipe. Bypassing shall be maintained until the new concrete invert has cured, to the satisfaction of the Engineer.

#### D. Joints:

#### 1. General:

- a. Make joints in accordance with the pipe manufacturer's recommendations and the requirements below.
- b. Cut piping accurately and squarely and install without forcing or springing.
- c. Ream out all pipes and tubing to full inside diameter after cutting. Remove all sharp edges on end cuts.

- d. Remove all cuttings and foreign matter from the inside of pipes and tubing before installation. Thoroughly clean all pipe, fittings, valves, specials, and accessories before installing. Bell and spigot mating surfaces shall be thoroughly wire brushed and wiped clean and dry immediately before pipe is installed.
- 2. Gaskets shall be suitable for service intended in accordance with manufacturer's ratings and instructions.
- 3. Lubricate and adjust gaskets and "O" rings as recommended by manufacturer.
- 4. After "O" rings are compressed and before pipe is brought fully home, each gasket shall be carefully checked for proper position around full circumference of the joint.

## E. Backfilling:

- 1. Conform to applicable requirements of Section 02200, Earthwork.
- F. Transitions from One Type of Pipe to Another:
  - Provide all necessary adapters, specials and connection pieces required when connecting different types and sizes of pipe or connecting pipe made by different manufacturers.
  - 2. Where new pipe is to be connected to existing pipe, the existing pipe shall be cut straight and smooth. The two pipes shall be joined with a flexible neoprene boot with stainless steel compression straps. This boot shall be manufactured by Fernco, or equal. Contractor shall verify type, size and class of existing sewer where replacement pipe is being installed and order the appropriate "Fernco Coupling" as necessary. Be advised that standard style couplings will not be permitted to be installed on sewers of different materials, class or size. Provide a concrete cradle support at all couplings, as detailed on the drawing or directed by the Engineer.

- G. Restraints, Supports and Thrust Blocks:
  - 1. Provide concrete and metal cradles, collars, kickers, and blocks as shown or otherwise required and approved by Engineer.

#### H. Unauthorized Excavation:

1. Whenever the excavation is carried beyond or below the lines and grades shown on the Drawings, or given by the Engineer, the Contractor shall, at their own expense refill such excavated space with gravel, as directed by the Engineer.

# I. Disposal of Material:

1. Surplus excavated material, either unsatisfactory or over and above that required for backfilling shall be disposed of by the Contractor at their own expense, off the site of the work in a lawful manner at approved disposal sites.

#### J. Removal of Water:

- 1. The Contractor's attention is directed to the fact that some of the work may be below the existing water table or perched water encountered in the work. The Contractor is invited to take borings at their own expense to verify soil conditions and groundwater elevations.
- 2. The Contractor shall at all time during the construction of the work provide and maintain ample and adequate means and equipment with which to promptly remove and properly dispose of all water entering excavations, and they shall maintain the groundwater level at an elevation at least 1 foot below the elevation of the bottom of the trench or bottom of excavation for structures, and maintain this depressed water level until the pipes or structures to be constructed therein are completed. Any method of dewatering excavations which does not satisfactorily fulfill and maintain the above condition shall be discontinued and a method of dewatering which will produce the required results shall be substituted therefore. Water shall not be

allowed to rise over concrete for 24 hours after completion of a pour, or around pipes or other structures where it might cause damage to the work. The Contractor shall obtain any permits necessary for their dewatering operations at their own expense.

#### K. Width of Trench

The width of pipe trench shall in all cases be kept 1. as narrow as practicable, depending upon size and depth of sewer and type of sheeting and bracing to be installed and shall be a maximum of 5 feet for pipes equal to or less than 12-inches in diameter and a maximum of 6 feet wide for pipes larger than 12 inch diameter. It shall be of sufficient width to properly lay and join the pipe and consolidate all backfill under the haunches and around the pipe, as required. No unwarranted width of trench shall be excavated which would unnecessarily increase the extent of damage to existing pavements or interference with utilities or other subsurface structure or interfere with maintenance of traffic. If the Contractor should exceed these widths, resulting in the overstressing of the pipe, they shall supply a stronger class of pipe, an improved class of bedding, or both, as directed by the Engineer, at no additional cost. Restoration required as a result of a greater trench width wider than indicated in the Contract Drawings shall be at the expense of the Contractor.

## L. Protection of Utilities

1. The Contractor shall be responsible for the care and protection of all underground piping, conduits, cables, duct banks and other subsurface lines and structures that may be encountered inside or outside the scheduled trench width of the work. Any damage caused to such facilities shall be promptly repaired or rectified by the Contractor at their expense. The Contractor shall locate and protect all existing utilities and provide supports, bracing, etc. required to prevent damage during construction.

# 3.3 TESTING OF PIPING (DEFLECTION TESTING ONLY)

#### A. General:

- 1. Test all piping as specified below unless otherwise authorized by Engineer.
- 2. Notify Engineer 48 hours in advance of testing.
- 3. Provide all testing apparatus including pumps, hoses, gages, and fittings including temporary restraints, etc.
- 4. Pipelines shall hold the specified test pressure for a period of four hours.
- 5. Pipelines which fail to hold specified test pressures or which exceed the allowable leakage rate shall be repaired and retested.
- 6. Test pressures required are at the lowest elevation of the pipeline section being tested, unless otherwise specified.
- 7. Unless otherwise approved, conduct all tests in the presence of the Engineer.
- 8. All pipe shall be tested between manholes.

# B. Test Requirements:

- 1. All sanitary sewers shall be visually tested for watertightness throughout their entire length.
- 2. The cost of all labor, materials, equipment and incidentals, whether or not here specified, necessary for the testing, retesting and repairing of the sewer system consistent with the intent of this section is deemed included under the appropriate contract bid item(s) for furnishing and installing the pipe being tested. Waterproofing of existing manholes (if applicable) shall be provided as required to obtain acceptable leakage rates, at no additional cost to the Owner.
- 3. Refer to Specification Section 18051, Buried Piping Installation for additional requirements.

#### C. Deflection Test:

- 1. All testing shall be conducted in the presence of the Engineer or their representative. This test shall be conducted after the final backfill has been in place at least 30 days to permit stabilization of the soil pipe system.
- 2. Deflection testing shall be performed by the Contractor on all PVC sewer and pressure pipe following the installation of house connections, and the placement and compaction of backfill, except as follows:
  - a. Deflection testing of house connection pipe is not required.
  - b. Deflection testing of AWWA, C-900, DR18 Pressure Pipe is not required.
- 3. Pipe deflection shall be tested by manually pulling a "go-no-go" deflection testing mandrel through the pipe. The mandrel shall have a diameter of not less than 96 percent of the base inside diameter of the pipe. The Contractor shall submit shop drawings for approval by the Engineer, of the size and type of mandrel to be used for each size and class of pipe tested. The testing device shall have the specified accuracy in all positions of rotation.
- 4. Total deflection in any direction shall not exceed 5 percent of the nominal inside diameter of the pipe.
- 5. The Contractor shall furnish all labor, equipment, and incidentals necessary to properly perform this test.
- 6. Should a deflection test exceed the maximum allowance, the Contractor shall undertake such remedial action, as required by the Engineer, to reduce the deflection to within the specified allowance and perform retests at no cost to the Owner. In-place rounding of the pipe will not be permitted.
- 7. Prior to making any repairs, the Contractor shall make the necessary submittals, and receive the

necessary approvals of the Owner and Engineer. The Engineer shall be the sole judge as to whether the pipe shall be repaired or replaced.

## 3.4 CLEANING

A. All piping shall be thoroughly cleaned and flushed prior to placing in service in a manner approved by Engineer.

+ + END OF SECTION + +

### SECTION 02485

#### GRASS RESTORATION

#### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. Scope: The General Contractor shall furnish all labor, materials and equipment necessary to restore grass areas disturbed by the construction. The limits of restoration will be determined by the Engineer. Disturbance of grass areas shall be kept to a minimum during construction.
- B. In the event that seeding restoration fails or is not feasible due to season, the Contractor shall be required to restore the grass areas with sod.
- C. Related Work Specified Elsewhere:
  - 1. Section 02200, Earthwork

# 1.2 SUBMITTALS

- A. General: Submit shop drawings in accordance with Section 01342 of the Contract Specifications.
- B. The Contractor shall submit certificates of materials compliance before delivery of material for the following items:
  - 1. Topsoil
  - 2. Seed
  - 3. Fertilizer (10-6-4)
  - 4. Limestone
  - 5. Mulch

#### PART 2 - PRODUCTS

## 2.1 TOPSOIL

- A. The topsoil shall consist of a fertile, friable, natural top soil of loamy character, without admixtures of subsoil, uniform in quality and shall be free from refuse of any nature, hard clods, stiff clay, sods, hard pan, pebbles larger than 3/4 inch in diameter, coarse sand, noxious weeds, sticks, brush, or other rubbish.
- B. The topsoil shall be taken from a well drained, arable site, preferably one which has been under cultivation at least 5 years previous to the time of removal.
- C. The topsoil shall contain not less than 5 percent nor more than 20 percent organic matter, as determined by loss on ignition of oven-dried samples. The samples shall be thoroughly oven-dried to constant weight at a temperature of 221 degrees F.
- D. The Hydrogen Ion value of all topsoil shall be not less than 5 and not more than 7. After the testing of the samples of material, if the loam is found to be unsatisfactory for the intended use, the Engineer may require that the Contractor, without additional compensation, add to the top soil proposed by them for use, lime, particular fertilizer or particular humus, as directed in order to make the topsoil suitable.
- E. Mechanical Analysis: The sieve analysis on an oven-dried sample shall be as follows:

Sieve Size	<pre>% Passing by Weight</pre>
1 inch	100
1/4 inch	97-100
# 100	40-60
# 200	40-60

F. Topsoil available on site which meets the specified requirements may be utilized with the permission of the Engineer. The Engineer may require that the Contractor, without additional compensation, add to the topsoil proposed by them for use, lime, particular fertilizer or particular humus, as directed in order to make the topsoil suitable.

G. Topsoil, except for topsoil stripped from the work areas, shall be a commercial product obtained from NYSDEC registered and/or permitted off-site sources.

## 2.2 SEED

A. General: Grass seed shall be fresh, recleaned seed of the latest crop. Material other than pure live seed shall comprise only nonviable seed, chaff, hulls, harmless inert matter and shall be free from noxious weeds. The mixture shall have less than one quarter (1/4) of one (1) percent weed content. Seed shall be mixed before delivery and shall consist of the mixture specified and in conformity with the following proportions by weight and meeting with the following standards of seed content. The percentage of purity shown on the label will be acceptable. The percentage of germination shall not be less than the minimum specified.

#### B. Mixtures

	Mixture Tolerance		Germination Tolerance	
Proportions of Mixture	Minus	Plus	<u>Germination</u>	Minus
60% Jaguar Tall Fescue	3%	5%	90%	6%
25% Omega II Perennial Rye Grass	3%	5%	85%	7%
15% Classic Kentucky Bluegrass	3%	5%	80%	7%

The following brand name mixtures are approved substitutes: Manhattan, Pennfine, N.K. 200 or Norlea in the proper percentages of mixture or any other current approved brand name mixture.

C. Packaging: All grass seed shall be delivered in unopened standard size bags of the vendor showing weight, analysis and the name of vendor. It shall be stored in such a manner that its effectiveness will not be impaired.

# 2.3 SOD (NOT IN CONTRACT)

# A. Materials

1. Sod shall be nursery grown and at least two years old. It shall be free of insects, grubs, fungus

- disease and noxious weeds and shall have a pH value of not less than 6.5.
- 2. The cultivated sod shall be 100% Merion grass sod.
- 3. Sod shall be a minimum of 1 inch thick and cut in uniform strips 1 foot by 4 feet minimum. Root development shall be capable of supporting sod during handling, transporting and laying. Sod shall not be installed in strips less than 1 foot in width.
- 4. Top growth shall be thick and matted. The turf shall be green and growing. Prior to cutting and transporting, the sod shall be well irrigated and have been recently mowed.
- 5. Native soil on the roots of the sod shall be maintained during process of transplanting.
- 6. Fertilizers shall be suitable commercial types.

#### B. Method

- 1. The surfaces of the areas to be covered with sod shall be trimmed, topsoiled to a minimum depth of 4 inches and graded to one inch below finished elevation by cutting and/or filling, as required, and as directed by the Owner.
- 2. The sod bed shall be raked and all foreign matter shall be removed and disposed of from the site.
- 3. Soil amendments and fertilizers shall be evenly spread over the prepared area and thoroughly raked in to incorporate it with the soil. Lime shall be incorporated in the soil at the rate of 50 pounds per 1000 square feet and superphosphate at the rate of 25 pounds per 1000 square feet.
- 4. Sod shall then be laid and set to the required grade on a reasonably moist bed with joints staggered. It shall be laid smoothly, edge to edge, and all openings plugged with sod. After laying, the sod shall be pressed firmly into contact with the bed by tamping and rolling to eliminate all air pockets and produce a uniform, even surface true to grade.

- 5. Sod shall be planted within 24 hours from the time of cutting unless tightly rolled or stored (roots to roots) and the stacks kept moist. Storage for a period in excess of five days will, under no circumstance, be permitted. Should the completed sod surface become gullied, eroded, or otherwise damaged, the affected areas shall be re-sodded as required and at the Contractor's expense.
- 6. The Contractor shall be responsible for proper protection and maintenance of the sodded areas. Where sod fails to grow, the Contractor shall prepare and re-sod these areas at their expense. During dry weather the Contractor shall water the sodded area frequently enough to ensure growth.

## 2.4 COMMERCIAL FERTILIZER

- A. Composition: Commercial granular fertilizer shall have the following composition by weight: Nitrogen ten (10) percent; Phosphoric Acid six (6) percent; Potash four (4) percent. The Nitrogen shall be fifty (50) percent organic (from organic sources, e.g., fish meal, dried blood, dried manure, activated sewage sludge castor pomace, cottonseed meal, etc.) and fifty (50) percent inorganic. The elements shall be available according to the methods adopted by the Association of Official Agricultural Chemists.
- B. Packaging: Fertilizers shall be packed in the manufacturer's standard containers weighing not over one hundred (100) pounds each with the name of the material, net weight of contents and the manufacturer's name and guaranteed analysis appearing on each container.

#### 2.5 GROUND LIMESTONE

A. Composition: Ground limestone (calcium carbonate) shall have the following analysis: At least fifty (50) percent shall pass a two hundred (200) mesh sieve; at least seventy (70) percent shall pass a one hundred (100) mesh sieve; and one hundred (100) percent shall pass a ten (10) mesh sieve. Total carbonates shall not be less than eighty (80) percent or 44.8 percent calcium oxide equivalent; for purposes of calculation, total carbonates shall be considered as calcium carbonate.

B. Packaging: Ground limestone packed in the manufacturer's standard containers shall weigh not over one hundred (100) pounds each with the name of the material, net weight of contents and the manufacturer's name and guaranteed analysis appearing on each container. Bulk shipments shall be accompanied by a certificate covering the names, weight and analysis as specified herewith for packaged material.

#### 2.6 MULCH-WOOD FIBER

- Wood fiber suitable for use as mulch for Α. General: seeding shall be processed so that the fibers will remain in uniform suspension in water under agitation and will blend with grass seed, fertilizer, ground limestone and other additives to form a homogenous slurry. It shall the characteristics which, upon hydraulic application, shall form a blotter-like ground coating with moisture absorption and percolation properties and the ability to cover and hold grass seed in intimate contact with the soil. Wood fiber shall contain no growth or germination inhibiting factors and shall be dved green. The wood fiber mulch shall be "Silva Fiber" as manufactured by Weyerhaeusar or approved equal.
- B. Packaging: Wood fibers shall be supplied in the manufacturer's unopened standard containers weighing not over one hundred (100) pounds each, with the name of the material, net weight of contents, the manufacturer's name and the air dry weight of fiber (equivalent to ten [10] percent moisture) appearing on each container.

## 2.7 HYDROSEED

A. Composition: Hydroseed at 170#AC (Ecology Mix). 80% Reliant Hard Fescue. 20% Jamestown Chewings Fescue.

## PART 3 - EXECUTION

## 3.1 GENERAL

A. When permitted by the Engineer, topsoil excavated under other Sections of this Specification shall be reused to provide a six inch layer of topsoil over the areas required to be seeded. If after backfilling of excavations there are insufficient quantities of top

soil conforming to the specified requirements, the Contractor will be required to supply the necessary material to provide a six (6) inch layer of topsoil over the areas to be seeded. Where directed by the Engineer the surface of the subsoil shall be scarified or tilled to a minimum depth of two (2) inches before topsoil or soil is placed to permit bonding of the upper soil layer with the subsoil.

- B. When delays in seeding operations carry the work beyond the specified seasons or when conditions of high winds, excessive moisture or frost are such that satisfactory results are not likely to be obtained for any stage of the work, the Engineer will stop the work. The work shall be resumed with the Engineer's approval when the desired results are likely to be obtained or when approved corrective measures and procedures are adopted.
- C. The Contractor shall be liable for any damage to property caused by seeding operations and all areas disturbed shall be restored to their original conditions to the satisfaction of the Engineer.
- D. One inch of water per week shall be applied on seeded areas for adequate soil saturation as required by weather conditions and as ordered by the Engineer until final acceptance. Watering shall be continued until final payment. Watering shall be done in a manner which will not cause erosion or other damage to the finished surfaces. Any surfaces which become gullied or otherwise damaged shall be repaired to reestablish the grade and conditions of the soil prior to seeding. After the repairs have been made the areas shall be reseeded as specified. Water for seeding is available on site at no cost to the Contractor.

#### 3.2 GRASS SEEDING

- A. Time of Seeding: Seeding shall be performed from March 1 to April 30 and from September 15 to October 15 unless otherwise approved. The Contractor shall notify the Engineer at least 48 hours in advance of the time they intends to begin seeding and shall not proceed with such work until permission has been granted.
- B. Preparation of Areas: The areas to be seeded shall be cultivated and cleaned of all vegetative growth to a

depth of six (6) inches except as otherwise directed by the Engineer on designated areas where topsoil has been furnished and placed to a depth of six (6) inches immediately prior to seeding. All weeds, roots, stumps, large stones and debris shall be removed. All washouts or other surface irregularities shall be repaired and additional topsoil shall be placed over the area as required until the entire area to be seeded is covered with a minimum of six (6) inch compacted layer of topsoil. The areas to be seeded shall then be rough graded to conform to the proper elevations as directed by the Engineer.

- C. Final Preparations of Seed Bed: The areas to be seeded shall be cultivated with a disc, rototiller or scarifier to a depth of four (4) inches. The areas shall be smoothly graded to the proper elevations, free from all unsightly ridges, depressions or undue irregularities. Areas to be seeded that cannot be cultivated by mechanical means shall be scarified by hand to attain the degree of smoothness and uniformity of adjacent lawn areas. Any soft areas shall be thoroughly compacted with an accepted roller weighing at least 200 pounds.
  - 1. All topsoil not used is to be removed and disposed of.
  - 2. Ground limestone shall be evenly distributed at the rate of one-half (1/2) pound per square yard and worked into the top three (3) inches of the soil during the cultivation required for the final preparation of seed bed.
  - 3. Commercial fertilizer (10-6-4) as specified shall be evenly distributed at the rate of ten (10) pounds per 1,000 square feet using an approved mechanical spreader and shall be worked into the top one (1) inch of the soil.
  - 4. In the event that it rains between the time the soil on any area is prepared and before it is seeded by any specified method, the soil on all areas to be seeded shall be completely pulvarized to a depth of one inch as determined, directed and approved by the Engineer.

# D. Sowing Seed:

- 1. Grass seed shall be sown evenly at the rate of one hundred fifty (150) pounds per acre. All seeding is to be done on dry or moderately dry soil and at times when the wind does not exceed a velocity of five (5) miles per hour.
- 2. A mechanical seeder may be used such as a Brillion seeder or equal to distribute the seed. Rolling will not be necessary.
- 3. If the grass seed is to be sown by hand the seed shall be evenly distributed and lightly raked into the top (1/4) inch of soil. After seeding and raking, the soil surface is to be rolled with an accepted roller weighting at least two hundred (200) pounds.

# E. Hydroseeding:

- 1. Apply seeding materials with an approved hydroseeder.
- 2. Fill tank with water and agitate while adding seeding materials. Use sufficient fertilizer, mulch, and seed to obtain the specified application rate. Add seed to the tank after the fertilizer and mulch have been added. Maintain constant agitation to keep contents in homogeneous suspension. Prolonged delays in application or agitation that may be injurious to the seed will be the basis of rejection of material remaining in tank.
- 3. Distribute uniformly a slurry mixture of water, seed, fertilizer, and mulch at a minimum rate of 57 gallons per 1000 sq ft (2500 gallons per acre). The Engineer may order the amount of water increased if distribution of seeding materials is not uniform.
- F. Seeding with Erosion Control Fabrics: Erosion control fabrics shall be applied in accordance with the seed manufacturers' instructions as modified, directed and approved by the Engineer.

## 3.3 ESTABLISHMENT OF SEEDED AREAS

A. The Contractor shall maintain, mow and protect the seeded areas until a uniform stand of grass approximately two and one half (2-1/2) inches high has been obtained (minimum of three cuttings) and on a weekly basis until physical completion of the work. Any areas which have been damaged or fail to show a uniform stand of grass shall be scarified, refertilized and reseeded with the original seed mixture until all the designated areas are covered with grass.

+ + END OF SECTION + +

### SECTION 02529

### CONCRETE CURBS, GUTTERS AND SIDEWALKS

#### PART 1 - GENERAL

#### 1.1 DESCRIPTION

### A. Scope:

- The General Contractor shall furnish all labor, materials, equipment and incidentals required to provide concrete curbs, gutters and sidewalks as shown and specified.
- 2. The types of Work covered by these Specifications are conventionally-formed or machine-formed curbs, gutters and sidewalks.
- 3. The thickness and extent of curbs, gutters and sidewalks are shown on the Drawings.

# B. Related Work Specified Elsewhere:

- 1. Section 02200, Earthwork.
- 2. Section 03100, Concrete Formwork
- 3. Section 03200, Reinforcing Steel.
- 4. Section 03251, Construction Joints.
- 5. Section 03300, Cast-In-Place Concrete.
- 6. Section 05540, Castings.

# 1.2 QUALITY ASSURANCE

### A. Reference Standards:

- 1. Comply with standards specified herein and as listed in Section 01072 of the contract specifications.
- 2. Referenced specifications: The New York State
  Department of Transportation Standard
  Specifications (NYSDOT Specifications) for

Construction and Materials, or Nassau County Department of Public Works (NCDPW) Specifications, most recent edition, plus addenda when referred to, shall become part of this specification for construction requirements. materials and referenced New York State (NYS) Pay Item Number or NCDPW Item Number shall serve to describe the required work for this project providing materials and construction conforming to all applicable under NYSDOT or requirements the Specifications for that New York State or NCDPW Item, except for measurement and payment. The measurement and payment section of the NYSDOT Specification or NCDPW Specifications shall not apply. Where the referenced specification cites requirements differing from those included in these specifications, the more stringent, highest quality requirement shall govern.

- 3. ASTM D 6690, Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
- B. Qualifications of manufacturers: Products used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the Engineer.

#### 1.3 SUBMITTALS

- A. Samples: Submit for approval samples, manufacturer's product data, test report, and material certifications as required in referenced Sections for concrete Work.
- B. Certificates: Manufacturer's certification that sealer meets Specification requirements.
- C. Shop Drawings: Submit for approval copies of dimensioned layout of the Work, showing pattern, expansion joints and reinforcing.
- D. Proposed layout of reinforcing bar.
- E. Concrete Mix Designs
- F. Curing Compounds

# PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Reinforcing Bars and Welded Wire Fabric: Deformed steel bars and smooth wire fabric shall comply with requirements of Section 03200, Reinforcing Steel. Furnish wire fabric in flat sheets, not rolls.
- B. Concrete Materials: Comply with requirements of Section 03300, Cast-In-Place Concrete.
- C. Expansion and Construction Joints: Comply with requirements of Section 03251, Construction Joints.

# PART 3 - EXECUTION

#### 3.1 SUBGRADE PREPARATION

- A. Preparation of the subgrade including compaction shall be completed for the full width of the Work:
  - 1. Where the subgrade is constructed by excavation of existing grade, the top 6 inches of the subgrade shall be compacted to at least 90 percent of maximum density at optimum moisture content.
  - 2. Where the subgrade is constructed on fill:
    - a. The existing grade shall be made smooth and compacted per Section 3.1-A.1.
    - b. The subgrade shall be brought to the final lines and grades utilizing select fill as specified in Section 02200, Earthwork.
  - 3. Base: Base shall be provided as shown on the Contract Drawings. The material shall be select fill as specified in Section 02200, Earthwork, and compacted as specified.

### 3.2 FORM CONSTRUCTION

A. Set forms to line and grade. Install forms over full length of curbs, gutters and sidewalks.

### 3.3 REINFORCEMENT

A. Locate, place, and support reinforcement as specified in Section 03200, unless otherwise shown. Size of reinforcement shall be as shown.

# 3.4 CONCRETE PLACEMENT

- A. General: Comply with the requirements of Section 03300 for mixing and placing concrete, and as specified.
- B. Place concrete for curbs and gutters using methods which prevent segregation of the mix. Consolidate concrete along the face of forms with an internal vibrator.
- C. For sidewalks, place concrete in one course, monolithic construction, for the full width and depth of walks.
- D. Machine Formed: Automatic curb gutter and sidewalk machine may be used for forming, at Contractor's option. Concrete shall have properties as specified in Section 03300, except that maximum slump shall be 2 1/2 inches and air content shall be 2 percent of design. Machine forming shall produce curbs, gutters and sidewalks to the required cross section, lines, grades, finish, and jointing, as specified for conventionally-formed concrete. If results are not acceptable to the Engineer, remove and replace at Contractor's expense.

#### 3.5 JOINTS

- A. General: Construct expansion, contraction, and construction joints with faces perpendicular to surface of the curb, gutter and sidewalk. Construct transverse joints at right angles to the Work centerline and as shown.
- B. Contraction Joints: Provide these joints at 10 feet on centers for curbs and gutters and 5 feet on centers for sidewalks.
- C. Construction Joints: Place joints at locations where placement operations are stopped for a period of more than 1/2 hour, except where such pours terminate at expansion joints.
- D. Expansion Joints: Provide 1/2-inch expansion joint filler where Work abuts structures, at returns, and at

30-foot spacing for straight runs. If curb, gutter, and sidewalk are not poured monolithically, provide expansion joints where each abuts the other.

1. Place top of expansion joint material not less than 1/2 inch or more than 1 inch below concrete surface. Apply joint sealer on top of expansion joint material flush with concrete surface, and in accordance with manufacturer's instructions.

### 3.6 CONCRETE FINISHING

- A. Smooth the exposed surface by screening and floating.
- B. Work edges of gutter and sidewalks, back top edge of curb, and transverse joints, and round to 1/4-inch radius.
- C. Complete surface finishing by drawing a fine-hair broom across surface, perpendicular to line of traffic.

### 3.7 CURING

A. Protect and cure finished concrete curbs, gutters and sidewalks, complying with applicable requirements of Section 03300.

### 3.8 REPAIR AND CLEANING

- A. Repair or replace broken or defective curbs, gutters and sidewalk as directed by the Engineer.
- B. Sweep work and wash free of stains, discolorations, dirt or other foreign material.
- C. Curb outside limits approved by the Engineer which is broken or damaged through operations of the Contractor shall be removed and replaced by the Contractor at their own expense.
- D. The Contractor shall exercise care so as not to damage the roadway when removing curbs. Any damage to the roadway outside authorized repavement lines shall be repaired to the full depth of the existing pavement at the Contractor's expense.

+ + END OF SECTION + +



### SECTION 02829

### STEEL PIPE BOLLARDS

#### PART 1 - GENERAL

### 1.1 SCOPE

A. General Contractor shall provide all Design and Construction services related to Steel Pipe Bollards Work as required for a complete building and site project as specified and shown on the Contract Drawings.

#### 1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 02200, Earthwork
- B. Section 03300, Cast-in-Place Concrete

# PART 2 - PRODUCTS

# 2.1 MATERIALS

- A. Galvanized Steel Pipe: 8-feet long 6-inch diameter, standard weight (Schedule 40) (to be concrete filled).
- B. Concrete Fill: Normal weight 3000 psi, air entrained 6 percent plus or minus 1 percent. Mix in accordance with Method No. 1, 6 bags per cu yd min, allowable slump 2 to 4 inches.

#### 2.2 FINISHES

- A. Paint: As per Section 09900. Manufacturer shall be equal to Rust Oleum.
  - 1. Primer: No. 3202.
  - 2. Finish Coat: Safety Yellow
- B. Thermoplastic Bollard Cover
  - 1. Durable, flexible 0.125-inch thick high density polyethylene (HDPE) and UV treated for longevity post sleeves.

a. Color: Safety Yellow (or as selected by Owner)

### 2. Manufacturer:

- a. Bollard Cover USA
- b. Post Guard
- c. Or Approved Equal

### PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Set pipe in center of hole and brace plumb.
- B. Set Pipe with top 4-feet above finished grade
- C. Fill annular space around pipe with concrete, minimum 12-inches each side, and minimum 6-inches below pipe. Concrete shall terminate below surface restoration (topsoil and seed or pavement respectively)
- D. Fill pipe with concrete.
- E. Remove braces after concrete has set.
- F. Weld Cap
- G. Apply one coat of primer and two coats of finish paint, or one coat of primer and 1/8-inch thick HDPE Bollard cover in accordance with the manufacturer's printed instructions.

+ + END OF SECTION + +

# DIVISION 3 - CONCRETE



### SECTION 03100

### CONCRETE FORMWORK

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

A. Work included: Under this section, the General Contractor shall provide all labor, equipment and material necessary to furnish all formwork for cast-in-place concrete complete in place, and as shown on the drawings, specified herein and approved by the Engineer.

In general, work to be included under this section shall include, but not be limited to, the following:

- 1. Provide formwork in accordance with the provisions of this Section for all cast-in-place concrete shown on the Drawings or required by other Sections of these Specifications.
- 2. Provide formed openings for other trades.
- 3. Coordinate installation of items furnished by other trades.
- B. Related Work Described Elsewhere
  - 1. Section 03200, Reinforcing Steel.
  - 2. Section 03300, Cast in Place Concrete.

# 1.2 QUALITY ASSURANCE

- A. Design of formwork is the Contractor's responsibility.
- B. Standards: All work shall comply with the 2020 New York State Uniform Fire Protection and Building Code and with its referenced edition of the following standards.
  - 1. ACI 301: Specifications for Structural Concrete for Buildings.
  - 2. ACI 302: Recommended Practice for Concrete Floor and Slab Construction.

- 3. ACI 318: Building Code Requirements for Reinforced Concrete.
- 4. ACI 347: Recommended Practice for Concrete Formwork.
- 5. ACI 350: Code Requirements for Environmental Engineering Concrete Structures
- C. Allowable tolerances: Conform to ACI 301, Section 4.3.

# 1.3 DESIGN REQUIREMENTS

- A. The formwork shall be designed for loads, lateral pressure, and allowable stresses outlined in Chapter 4 Design of "Guide to Formwork for Concrete" (ACI 347).
- B. Design Calculations and Drawings: Forms, including shores and reshores, shall be designed by a professional engineer licensed to practice in New York State. The engineer's calculations and drawings shall be signed and sealed by the engineer and kept on the job. Formwork shall be constructed in accordance with the engineer's signed and sealed drawings.

### 1.4 SUBMITTALS

- A. General: Submit shop drawings in accordance with Section 01342, Shop Drawings, Product Data and Samples.
- B. Shop drawings: Submit details of form types, methods of form construction and erection, design computations, and location of form joints, form ties and embedded items.
- C. Product Data: Manufacturer's catalog sheets, specifications, and installation/application instructions for the following:
  - 1. Form systems and ties.
- D. Certificates: Submit certificates from manufacturers stating that materials meet specified requirements.
- E. Concrete test reports: Submit certified laboratory test reports if concrete tests are required for form removal.

F. Calculations: Submit early form removal calculations if required in advance of form removal.

# PART 2 - PRODUCTS

### 2.1 FORMWORK MATERIALS

A. General: Conform to ACI 301 and ACI 302 unless otherwise shown or specified.

#### B. Forms:

- 1. Construct formwork for exposed (painted or unpainted) concrete surfaces with smooth faced undamaged plywood or other panel type materials acceptable to the Engineer to provide continuous, straight, smooth as-cast surfaces. Furnish in largest practical sizes to minimize number of joints.
- 2. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without excessive and objectionable bow or deflection.

# 3. Wood forms:

- a. Framing lumber: Stress-graded.
- b. Lumber in direct contact with concrete: Dressed on at least the contact side, with dressed or tongue-and-groove edges.
- c. Other lumber: Dressed or rough.

### 4. Plywood forms:

- a. Grade marked.
- b. B-B Plyform, Exterior Class 1 and 2 and HDO High Density Concrete form Plywood, Class 1 and 2 conforming to Product Standard PS 1, minimum thickness 3/4-inch.
- 5. Hardwood forms: Tempered smooth-one-side (515), not less than 3/16-inch thick, conforming to product standard PS 58.

- 6. Fiber-glass-reinforced-plastic forms: Sizes and cross sections as required, with thicknesses, reinforcement, and surface finish to form concrete surfaces that are smooth and free of irregularity.
- 7. Steel forms: Sizes and cross sections as shown or required, with metal gauges, reinforcement, stiffeners, and surface finish to form concrete surfaces that are smooth, free of irregularity and concrete stains.
- A. Chamfer Strips: Wood, metal, PVC or rubber; 1 inch chamfer, unless otherwise indicated on the Drawings.
- D. Form coatings: Inner faces of all forms shall be thoroughly cleaned prior to concreting. Forms for concrete surfaces that will not be subsequently waterproofed shall be coated with a chemical type release agent and shall be applied lightly by spray to avoid retardation. Contractor shall submit release agent manufacturer to Engineer for approval. Forms for concrete surfaces to be waterproofed shall be wetted prior to concreting.

# 2.2 DESIGN OF FORMWORK

- A. General: Conform to ACI 301 and ACI 302 unless otherwise shown or specified.
  - 1. Design, erect, support, brace, and maintain formwork so that it will safely support vertical and lateral loads that might be applied, until such loads can be supported by the concrete structure.
  - 2. Carry vertical and lateral loads to ground by formwork system and in-place construction that has attained adequate strength for that purpose.
  - 3. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation, and position.
  - 4. Design forms and falsework to include assumed values of live load, dead load, weight of moving equipment operated on formwork, concrete mix, height of concrete drop, vibrator frequency,

ambient temperature, foundation pressures, stresses, lateral stability, and other factors pertinent to safety of structure during construction.

- 5. Provide shores and struts with positive means of adjustment capable of taking up formwork settlement during concrete placing operations, using wedges or jacks or a combination thereof.
- 6. Provide trussed supports when adequate foundations for shores and struts cannot be secured.
- 7. Support form facing materials by structural members spaced sufficiently close to prevent objectionable deflection.
- 8. Fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities, and within allowable tolerances.
- 9. Provide camber in formwork as required for anticipated deflections due to weight and pressures of fresh concrete and construct ion loads.
- 10. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints and provide backup material at joints as required to prevent leakage and fins.
- 11. Ties for forms shall be waterproof type.

### PART 3 - EXECUTION

### 3.1 GENERAL

A. Unless otherwise shown or specified, install and remove formwork in accordance with ACI 301, ACI 318, ACI 350, and ACI 347.

# 3.2 SURFACE CONDITIONS

A. Examine the substrate and conditions under which work of this Section is to be performed, and correct unsatisfactory conditions which would prevent proper and timely completion of the Work. Do not proceed until satisfactory conditions have been corrected.

### 3.3 FORM CONSTRUCTION

#### A. General:

- 1. Construct forms complying with ACI 347, to the exact sizes, shapes, lines and dimensions shown, and as required to obtain accurate alignment, location, grades, level and plumb work in finish structures.
- 2. Provide for openings, offsets, sinkages, keyways, recesses, moldings, reglets, chamfers, blocking, screeds, bulkheads, anchorages, inserts, and other features required. Use selected materials to obtain required finishes.
- 3. Forms for openings, and construction which accommodates installation by other trades whose materials and products must be fabricated before the opportunity exists to verify the measurements of adjacent construction which affects such installations, shall be accurately sized and located as dimensioned on the Drawings. In the event that deviation from the Drawing dimensions results in problems in the field, the contractor shall be responsible for resolution of the conditions as approved by the Engineer, without additional expense to the Owner.

# B. Fabrication:

- 1. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where the slope is too steep to place concrete with bottom forms only. Keep "groove, notch" wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and assure ease of removal.
- Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for

placement of concrete. Brace temporary closures and set tightly to temporary openings on forms in as inconspicuous locations as possible, consistent with design requirements. Form intersecting planes to provide true, clean cut corners.

### C. Falsework:

- 1. Erect falsework and support, brace and maintain it to safely support vertical, lateral, and asymmetrical loads applied until such loads can be supported by in-place construction. Construct falsework so that adjustments can be made for take-up and settlement.
- 2. Provide wedges, jacks, or camber strips to facilitate vertical adjustments. Carefully inspect falsework and formwork during and after concrete placement operations to determine abnormal deflection or signs of failure; make necessary adjustments to produce Work of required dimensions.

# D. Forms for exposed concrete:

- 1. Drill forms to suit ties used to prevent leakage of concrete mortar around the tie holes. Do not splinter forms by driving ties through improperly prepared holes.
- 2. Provide sharp, clean corners at intersecting planes, without visible edges or offsets. Back joints with extra studs or girts to maintain true, square intersections.
- 3. Use extra studs, walers, and bracing to prevent objectionable bowing forms between studs and to avoid bowed appearance in concrete. Do not use narrow strips of form material which will produce bow.
- 4. Assemble forms so that they may be readily removed without damage to exposed concrete surfaces.
- E. Corner treatment: Unless shown otherwise, form chamfers with strips on external corners of columns, walls, girders, beams, foundation walls projecting beyond overlying masonry, and other external corners that will

- be exposed. Extend terminal edges to required limit and miter chamfer strips at changes in direction.
- F. Provision for other trades: Provide openings in concrete formwork to accommodate work of other trades. Verify size and location of openings, recesses and chases with the trade requiring such items. Accurately place and securely support items to be built into forms.
- G. Cleaning and tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before concrete is placed. Retighten forms immediately after concrete placement as required to eliminate mortar leaks.

### 3.4 FORM COATINGS

A. Coat form contact surfaces with form-coating compound before reinforcement is placed. Do not allow excess form-coating material to accumulate in the forms or to come into contact with surfaces which will be bonded to fresh concrete. Apply in compliance with manufacturer's instructions.

# 3.5 INSTALLATION OF EMBEDDED ITEMS

- A. General: Set and build into the work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of the items to be attached thereto.
- B. Edge forms and screed strips for slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in the finished slab surface. Provide and secure units to support types of screeds required.
- C. Those trades whose work is related to the concrete or must be supported by it shall be given ample notice and opportunity to install embedded items before the concrete is placed. Provide openings in concrete formwork to accommodate the Work of related contracts. Obtain information for size and location of openings, recesses, chases from contractor requiring such items.

- D. Electrical conduits, junction boxes, pipes, sleeves, inserts and similar items shall be placed in the concrete in accordance with all of the requirements of the Building Code. Such items shall be protected to the extent that they are not displaced or damaged during the placing of concrete.
- E. Openings in slabs shall be provided for pipes, conduits and the like required for the work of other trades. When such work is completed, the excess part of the respective openings shall be completely closed up to the pipe sleeve with waterstops or inserts, matching the adjoining work.
- F. Sleeves for miscellaneous metal work, such as castings, pipes and anchors shall be set as indicated, true and to proper alignment.
- G. Waterstops shall be installed so as to form a continuous watertight diaphragm. Adequate provision shall be made to support and completely protect the waterstops during the progress of the work. Splices shall be made in conformance with the recommendations of the waterstop manufacturer.

# 3.6 ANCHORAGE ITEMS

- A. Anchorage items shall be of sufficient number, size and location to ensure sufficient anchorage for the purpose intended.
- B. Adequate slots or inserts shall be provided for anchoring members at openings. Slots and dowels shall be provided for anchoring ends and tops of masonry partitions abutting concrete.
- C. Inserts for suspended ceilings shall be spaced at 4 feet on centers.

### 3.7 JOINTS

A. Provide isolation, control, contraction, expansion and construction joints in accordance with Section 03251 and also as shown on the drawings. The Contractor shall prepare drawings showing all joints for the Engineer's approval before pouring the concrete.

B. Continue reinforcing steel and wire fabric across construction joints where not indicated as being free to move.

### 3.8 REMOVAL OF FORMS

A. Forms shall not be disturbed until the concrete has adequately hardened. Shoring shall not be removed until the supported member has acquired sufficient strength to support its weight and the load upon it. Members subject to additional loads during construction shall be adequately shored to sustain all resulting stresses. Removal of forms shall be accomplished in such a manner and sequence as will prevent injury to the concrete. Forms and shoring used to support the weight of concrete in beams, slabs and other structural members shall be removed in accordance with recommendations in paragraph 3.2.5 of "Recommended Practice for Concrete Formwork" (ACI 347-14).

Provisions of ACI 301, Sections 4.5, 4.6 and 4.7 apply. Subject to the Owner requirements and upon approval, forms may be removed at the following minimum times unless high-early strength is specified. Shoring may be required at the option of the Engineer beyond these periods.

B. Removal of Forms and Supports:

Temperature	Over	70°F	60°F	50°F	Below 50°F
	95°F	_	_	_	
		95°F	70°F	60°F	
Walls	5 days	1 day	2	3	Do not
			days	days	remove forms
Columns	7 days	2	3	4	until site-
		days	days	days	cured test
Slabs					cylinders
5" Thick	10	5	6	7	develop 50%
or Less	days	days	days	days	of 28 day
Over 5"		12	6	8	strength
Thick		days	days	days	(typical)

When high-early strength concrete is specified, a schedule for removal of forms will be developed in the field from the age/strength relationships established for the materials and proportions used by tests in accordance with ACI-301.

The removable portion of form ties shall be withdrawn from the concrete immediately after taking down the forms. After the ends or end fasteners of form ties have been removed, the embedded portion of the ties shall terminate not less than 3/4 inch from the formed surfaces of concrete. The holes left by such ties shall be filled with a polymer modified grout, and the surface shall be finished with a steel spatula or rubbed with sack cloth.

Care shall be taken in removing forms, wales, shorings, supports, and form ties to avoid spalling or marring the concrete. The required rubbed finish and such patching as may be necessary shall be started immediately after removal of the forms.

### 3.9 RECORD OF PLACING AND FORM REMOVAL

A. An accurate record shall be maintained of the dates of concrete placings and the exact location thereof and the dates of removal of forms. These records shall be available for inspection at all times on the job, and two copies shall be furnished to the Engineer upon completion of the concrete work.

# 3.10 REUSE OF FORMS

A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable. Apply new form coating compound material to concrete contact surfaces as specified for new formwork. When forms are reused for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure joints to avoid offsets.

+ + END OF SECTION + +



### SECTION 03200

### REINFORCING STEEL

#### PART 1 - GENERAL

#### 1.1 DESCRIPTION

### A. Scope:

1. General Contractor shall furnish and place all steel reinforcements for concrete, including all cutting, bending, fastening and any special work necessary to hold the reinforcement in place and protect it from injury and corrosion in accordance with the requirements of this section.

#### 1.2 REFERENCES

- A. Except as shown or specified otherwise, the Work of this Section shall conform to the applicable requirements of the following:
  - 1. Specifications for Structural Concrete, ACI 301-16 of the American Concrete Institute (ACI).
  - 2. Manual of Standard Practice, MSP-1-01 of the Concrete Reinforcing Steel Institute (CRSI).

### 1.3 QUALITY ASSURANCE

- A. Certifications: Affidavit by the bar reinforcement manufacturer certifying that bar material meets the contract requirements.
- B. Submit evidence of steel material compliance with this Specification. Evidence shall consist of certification of source of material, copies of purchase orders and manufacturer's certifications. For stock material, submit copies of latest mill or purchase orders for material replacement.

# 2.4 SUBMITTALS

- A. In accordance with the procedures and requirements set forth in the General and Special Conditions, Contractor shall submit the following:
  - 1. Shop Drawings.
  - 2. Mill test certificates.
- B. Each submittal shall be identified by the Specification Section No. in accordance with Section 01342.
- C. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed materials compliance with the Contract Documents.
- D. Partial, incomplete or illegible submissions will be returned to the Contractor without review for resubmission.
  - 1. Shop Drawings shall include but not be limited to:
    - a. Detailed placing and shop fabricating drawings, prepared in accordance with ACI 315 latest edition, shall be furnished for all concrete reinforcement. These drawings shall be made to such a scale as to clearly show construction joint locations, openings, the arrangement, spacing and splicing of the bars. No materials shall be cut or fabricated until related drawings have been approved by the Engineer.
    - b. Details of supports for horizontal reinforcing steel in slabs, beams, etc.
    - c. Certificates: Affidavit required under Quality Assurance Article.

### PART 2 - PRODUCTS

# 2.1 GENERAL

- A. Reinforcing bars shall be deformed new billet steel bars conforming to ASTM A 615, Grade 60. Epoxy coated reinforcing bars shall conform to ASTM A 775.
  - 1. Repair field cut edges and damaged area with patching materials conforming to ASTM A 775 or ASTM A 934 as applicable and in accordance with manufacturer's written recommendations.
- B. Wire mesh reinforcement shall conform to ASTM A 185. Epoxy coated wire mesh shall conform to ASTM A 884
- C. Mill test certificates shall be furnished to the Engineer for all shipments.
- D. Bar Supports; Either of the Following Types:
  - 1. Galvanized steel or AISI Type 430 stainless steel, and without plastic tips.
  - 2. Insoluble plastic, with minimum 1,500 psi tensile strength and capable of retaining fabricated shape at temperatures between 5 degrees F and 170 degrees F.
- E. Welded Wire Reinforcement Supports Shall comply with Class 1, maximum protection or Class 2, moderate protection per CRSI Manual of Standard Practice
- F. Tie Wire: Black annealed wire, 16-1/2 gage or heavier.
- G. Steel Wire: ASTM A 82, cold-drawn plain steel wire, size No. W2.9 unless otherwise indicated.
- H. Reed Clips: ASTM A 185, rigid type reed clips, fabricated of W1.4 steel cross wires spaced 12 inches apart and looped at edges of flanges, and W1.4 longitudinal wire. Reinforcement shall have two longitudinal wires for flanges 9 inches to 15 inches in width, and three longitudinal wires for flanges over 15 inches in width. Cross wires shall be welded to longitudinal wire(s).

### 2.2 BARS FOR WATER RETAINING STRUCTURES

- A. All Water Retaining Structures, i.e., clearwells, etc. shall have Epoxy Coated bars.
- All bars for reinforced concrete shall be coated with В. Scotchkote Brand Fusion Bonded Epoxy Coating 213 or 214 as manufactured by 3M, St. Paul, Minnesota, or equal. Masonry bars shall not be coated. Coating shall be applied to cleaned steel reinforcing bars by the electrostatic spray method and fully cured in accordance with the recommendations of the manufacturer of the coating material. Before coating, the bars shall be cleaned by abrasive blast cleaning to meet the requirements of near white metal in accordance with SSPC-SP10. The coating shall be applied to the cleaned surface as soon as possible after cleaning, and before oxidation of the surface discernible to the unaided eye occurs. However, in no case shall application of the coating be delayed more than 8 hours after cleaning. The film thickness of the coating after curing shall be 5 to 20 mils, inclusive, as measured using ASTM D7091 on the body of the reinforcing bar between the deformations and/or ribs on a straight length of bar. The coasting shall be free from holes, voids, cracks and damaged areas discernible to the unaided eye. Damaged or other unsatisfactory areas shall be patched with a coating material and by a method recommended by the coating manufacturer.

#### PART 3 - EXECUTION

### 3.1 FABRICATION AND STORAGE

- A. All reinforcement shall be cut and bent cold accurately to the required dimensions. Bends shall be made in conformance with the Manual of Standard Practice of the Concrete Reinforcing Steel Institute. If shipped to the job fabricated, it shall be properly bundled and tagged so that it can be handled without damage and readily identified with the approved placing diagrams. Direct heating of the bars shall not be permitted.
- B. Reinforcing steel shall be stored above ground on platforms or other supports and shall be protected from the weather at all times by suitable covering. It shall

be stored in an orderly manner and plainly marked to facilitate identification.

#### 3.2 PLACING REINFORCING BARS

- A. Chairs, tie wires, and other devices used to support, position, or fasten the reinforcement shall be made of or coated with, a dielectric material. The specific hardware that the Contractor proposes to use shall be approved by the Engineer.
  - 1. Steel reinforcement shall be placed in the position indicated and within the allowable tolerances specified. Before concrete is placed, all reinforcement shall be securely fastened and supported with approved chairs or other approved devices. Brick or concrete block are not acceptable supporting devices.
  - 2. Concrete shall not be placed until the reinforcing steel is inspected and permission for placing concrete is granted by the Engineer. All concrete placed in violation of this provision shall be rejected and removed.
  - 3. Reinforcement for slabs, beams, etc. poured directly on soil, shall be supported on chairs designed specifically for this purpose. Brick supports or the like will not be acceptable.
- B. <u>Field Bending</u> The alternatives of shop bending or field bending of bar reinforcement will be at the option of the Contractor. Field bending shall be done by cold methods only. Direct heating of the bars shall not be permitted.
  - 1. Field bending operations shall be allowed only when ambient and bar temperatures are 40°F or greater. When lower temperatures prevail the Contractor may supply, for field bending operations, a fully enclosed space that is heated and constructed to the satisfaction of the Engineer. No additional payment will be made for such an enclosure.
  - Epoxy coated bar reinforcement damaged by handling or field bending work shall be evaluated and repaired, or replaced, in accordance with the following:

### C. Field Repair:

- 1. Should water retention structures be included in the project, The use of Epoxy coated bars shall be required and the General Contractor will be required to field repair damaged areas of the bar coating, and to replace bars exhibiting severely damaged coatings. The material used for field repair shall be that supplied by the coating applicator.
  - a. Field repair will be required on all areas of damage. The total number of all damaged areas which have been repaired with patching material shall not exceed 5 in any 10-foot length of bar.
  - b. Field repair will not be allowed on bars which have severely damaged coatings as determined by the Engineer.
  - c. A reinforcing bar having coating damage determined by the Engineer to exceed the above criteria shall not be incorporated in the work, and it shall be removed from the work site. All such bars shall be replaced in kind with all cost borne by the Contractor.

# D. Splices:

- 1. Splices shall be permitted only where shown on the contract plans. Should the Contractor desire to splice bars at locations other than those shown on the contract plans, written permission to do so shall first be obtained from the Engineer. Such permitted splices shall be well distributed, or located, at points of low tensile stress. Splices shall not be permitted unless a minimum of 2 inches can be provided between the spliced bar and the nearest adjacent bar.
  - a. Splices for bars No. 11, or smaller, shall be made by placing the bars in contact and wiring them together for the full length of the splice.
  - b. Arc welding of water retaining structure epoxy coated reinforcing bar splices shall require the end of the bar to be welded and to be entirely clean of epoxy coating for the full length of the splice plus six inches. After

welding is complete, the cleaned portion of the bar shall be coated with epoxy. This may be accomplished by the use of the epoxy patching material. Coating of the clean portion shall overlap the original epoxy coating by at least six inches.

E. Wire mesh reinforcement shall be securely fastened at the ends and edges. Wire mesh shall be supported at elevations indicated prior to concrete placement. Edge laps shall not be less than one mesh in width and end laps not less than two meshes in length.

# 3.3 CONCRETE PROTECTION FOR REINFORCEMENT

A. The following minimum concrete cover (inches) shall be provided for reinforcement, except as otherwise noted on Contract Drawings.

Concrete cast against and 3 inches permanently exposed to earth

Concrete exposed to earth, weather 2 inches or liquid

Concrete not exposed to weather or in contact with ground:

Slabs, Walls 2 inches
Beams, Columns 2 inches
Exterior Slabs 2 inches

+ + END OF SECTION + +



### SECTION 03251

### CONSTRUCTION JOINTS

### PART 1 - GENERAL

### 1.1 WORK INCLUDED

A. The Contractor shall furnish all materials, labor and equipment required for the construction of all construction joints specified herein and shown on the Contract Drawings.

# 1.2 GENERAL INFORMATION

- A. Construction joints shall be provided in accordance with Section 03300.
- B. Manufacturer's instructions shall be strictly followed in the use of all materials specified under this section. If required by the Engineer, the Contractor shall arrange for the presence of a factory approved representative to ensure that proper procedures are followed.

#### 1.3 SUBMITTALS

- A. In accordance with the procedures and requirements set forth in the General Conditions and Special Conditions, the Contractor shall submit the following:
  - 1. Samples
  - 2. Shop Drawings
- B. Each submittal shall be identified by the Specifications section number as defined in Section 01342.
- C. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed materials compliance with the Contract Documents.

- D. Partial, incomplete or illegible submissions will be returned to the Contractor without review for resubmission.
  - 1. Samples shall include:
    - a. One sample of each type of PVC waterstop, each sample to include a splice.

### PART 2 - PRODUCTS

#### 2.1 BONDING AGENTS

- A. Epoxy Bonding Agent (Adhesive): 100 percent solids epoxy-resin-base bonding compound, complying with ASTM C 881, Types I, II, IV and V, Grade 2 (horizontal areas) or Grade 3 (overhead/vertical areas), and Class B (40-60 degrees Fahrenheit) or Class C (60 degree Fahrenheit and above).
  - 1. SurePoxy HM Series by Kaufman Products, Inc., 3811 Curtis Avenue, Baltimore, MD 21226, (800) 637-6372.
  - 2. Sikadur Hi-Mod 32 by Sika Corporation, 201 Polito Avenue, Lyndhurst, NJ 07071, (800) 933-7452.
  - 3. MasterEmaco ADH 327 RS by by Master Builders Solutions, 23700 Chagrin Blvd., Cleveland, OH 44122, (800) 628-9990.

### 2.2 WATERSTOPS CAST IN CONSTRUCTION JOINT

- A. Waterstops shall be provided in all construction joints in water bearing structures, all footing to foundation wall interfaces, and at other such locations as required by the Contract Drawings.
- B. Waterstops for construction joints shall be polyvinyl chloride (PVC).
- C. Waterstop Materials:
  - 1. PVC Waterstops: The polyvinyl chloride shall be extruded from an elastomeric plastic compound of which the basic resin shall be polyvinyl chloride

- (PVC). The compound shall contain any additional resins, plasticizers, stabilizers or other materials needed to ensure qualities which will meet the requirements of the Corps of Engineers' Specifications CRD-C-572-74.
- 2. The required minimum physical characteristics for this material are:
  - a. Size: Minimum 6 inches wide by 3/8 inch thick, unless otherwise indicated.
  - b. Minimum Tensile Strength (ASTM D 412): 2000 psi.
  - c. c. Minimum Ultimate Elongation (ASTM D 412): 350 percent.
  - d. d. Shore A/10 Durometer Hardness (ASTM D 2240): Minimum 65; Maximum 83.
  - e. e. Maximum 24-Hour Water Absorption (ASTM D 570): 0.15.
- 3. No reclaimed PVC shall be used for the manufacturing of the waterstops. The Contractor shall furnish certification that the proposed waterstops meet the above requirements.
- 4. Waterstops for construction joints within water containing structures and wherever shown on drawings, shall be dumbbell type with a minimum thickness of 3/8 inch. Waterstop shall be 6 inches wide except where 9-inch width is shown on Contract Drawings. Greenstreak (PVC) polyvinyl chloride water stops type 748 as manufactured by Sika Corporation, or approved equal shall be an acceptable product.
- 5. Waterstops for other construction joints and wherever shown on drawings, shall be ribbed with centerbulb type with a minimum thickness of 3/8 inch. Waterstop shall be 6 inches wide except where 9-inch width is shown on Contract Drawings. Greenstreak (PVC) polyvinyl chloride water stops type 732 as manufactured by Sika Corporation, or approved equal shall be an acceptable product.

#### D. Sealant:

- Sealant where shown on Contract Drawings shall be Sikaflex-la plus primer as recommended by Sika Corporation, or approved equal.
- 2. Backer rod where shown on Drawings shall be closed cell polyethylene foam as manufactured by Armacell, or approved equal.

#### 2.3 HYDROPHILIC RUBBER WATERSTOP - STRIP APPLIED

- A. All strip applied waterstops shall be hydrophillic rubber.
- B. Hydrophilic rubber waterstop materials shall be bentonite-free and shall expand by a minimum of 80 percent of dry volume in the presence of water to form a watertight joint seal without damaging the concrete in which it is cast. For location, see the Contract Drawings.
- C. The material shall be composed of resins and polymers which absorb water and cause an increase in volume in a completely reversible and repeatable process. The waterstop material shall be dimensionally stable after repeated wet-dry cycles with no deterioration of swelling potential.
- D. Hydrophilic rubber waterstop shall be solid rectangular shape with minimum cross sectional dimensions of 3/8-inch by 3/4-inch.
- E. Hydrophilic Rubber Waterstops shall be:
  - 1. Duroseal Gasket, Type 2010, as manufactured by BBZ USA, Inc, St. Louis, MO
  - 2. Sika Hydrotite CJ, as manufactured by Sika USA.
  - 3. Or approved equal.

### 2.4 EXPANSION JOINT FILLER

A. Expansion joint filler shall be provided where premolded filler is called for on Contract Drawings and at other similar locations.

- B. Expansion joint filler shall be sponge rubber as manufactured by W.R. Meadows, Inc. or approved equal. Materials shall meet specifications of ASTM D1752, Type I.
- C. Expansion Joint Dowels: Smooth steel expansion joint dowel with minimum 5-inch-long steel dowel cap, unless otherwise indicated.

#### D. Sealant:

- Sealant required on vertical joints where shown on Contract Drawings shall be "Pourthane-NS," urethane joint sealant as manufactured by W.R. Meadows, Inc., or approved equal.
- 2. Sealant required on horizontal joints where shown on Contract Drawings shall be "Pourthane-SL," urethane joint sealant as manufactured by W.R. Meadows, Inc., or approved equal.
- 3. Backer rod where shown on drawings shall be closed cell polyethylene foam as manufactured by Armacell, or approved equal.

### 2.5 FLATWORK PREFORMED EXPANSION JOINT

A. Preformed expansion joint filler shall be 1/2-inch non-extruding, and shall be Type IV Bituminous Fiber, conforming to ASTM Designation D 1751; asphalt expansion joint by W. R. Meadows, Inc. or approved equal.

# PART 3 - EXECUTION

### 3.1 CONSTRUCTION JOINTS

- A. Construction joints shall be between successive concrete pours as required by the contractor or as shown on the Contract Drawings where structural integrity is affected, otherwise, Contractor shall submit description of the joint and its location to the Engineer for approval.
- B. Unless noted otherwise on the Contract Drawings, construction joints shall be located near the middle of the spans of slabs, beams, and girders unless a beam

intersects a girder at this point. In this case, the joints in the girders shall be offset a distance equal to twice the width of the beam. Joints in walls and columns shall be at the underside of floors, slabs, beams, or girders and the top of footings or floor slabs unless noted otherwise on the Contract Drawings. Beams, girders, brackets, column capitals, haunches, and drop panels shall be placed at the same time as slabs. Joints shall be perpendicular to the main reinforcement.

- C. Horizontal construction joints within walls will not be permitted. In order to minimize shrinkage, long continuous walls shall not be poured at the same time. Maximum distance between horizontal joints in slabs and vertical joints in walls shall be 40'-0" unless otherwise indicated on the Contract Drawings. Concrete shall be placed in a checkerboard fashion.
- D. All corners shall be part of a continuous placement, and should a construction joint be required, the joint shall not be located closer than 12-feet from a corner.
- E. Waterstop shall be provided at all joints in water retaining structures. Waterstop shall be provided at all joints below grade in walls or slabs which enclose an accessible area.
- F. All reinforcing steel and welded wire fabric shall be continued across joints. Inclined dowels shall be provided as detailed or directed by the Engineer. Additional No. 3 reinforcing bars spaced at 12-inches on center shall be placed horizontally in each construction joint at the center of the section. These bars shall be 4-feet long and shall extend 2-feet each side of the joint. Reinforcing steel projecting through the joint shall be kept clean.
- G. All construction joints shall be provided with a keyway. The surface of the concrete at all joints shall be thoroughly cleaned and all laitance removed. Following methods are acceptable:
  - 1. The use of an approved chemical retarder applied in accordance with the manufacturer's recommendations which delays but does not prevent the setting of the surface mortar. Retarded mortar shall be removed within 24 hours after placing to produce a clean exposed aggregate bonding surface.

- 2. By roughening the surface of the concrete in an approved manner which will expose the aggregate uniformly and will not leave laitance, loosened particles of aggregate or damaged concrete at the surface.
- H. All construction joints shall be bonded by one of the following methods:
  - 1. The use of an approved adhesive or bonding agent applied in accordance with the manufacturer's recommendations.
  - 2. Use of Portland cement grout of similar proportions to the mortar in the concrete in an acceptable manner.
- I. The surface of the concrete at all joints shall be thoroughly cleaned and all laitance removed by wire brushing, air or light sand blasting. On horizontal joints where concrete is to be placed on hardened concrete, a slush coat of mortar 1/2 inch to 1 inch thick with slump less than 6 inches, made of the same materials as the concrete, but without the coarse aggregate, shall be worked well into the irregularities of the hard surface just ahead of the concrete pour.

## 3.2 CONTROL JOINTS

- A. Location of control joints shall be as shown on the Contract Drawings, or as directed by the Engineer.
- B. Control joints shall be formed with control joint inserts and caps.
- C. Sawcutting of control joints in lieu of forming shall not be allowed unless otherwise noted on the Contract Drawings. Where sawcutting is allowed, joints shall be sawed as soon as the concrete can support foot traffic without leaving any impression, normally the same day as concrete is placed and in no case longer than 24 hours after concrete is placed.
- D. Unless noted otherwise on the Contract Drawings, depth of control joints shall be 1-1/2 inches in reinforced concrete and 1/3 of concrete thickness in unreinforced concrete.
- E. Joints shall be filled with sealants as specified in this section.

### 3.3 EXPANSION JOINTS

- A. Size and location of expansion joints shall be as shown on the Contract Drawings.
- B. A center-bulb type waterstop shall be provided at all joints in pipe trenches and basements, and a dumbell type in all joints within water-retaining structures. A center-bulb type waterstop shall be provided at all expansion joints below grade in walls or slabs which enclose an accessible area. Waterstop shall be as shown on the Contract Drawings and specified herein.
- C. Expansion joint filler for use in concrete pavements and structures shall be Types I, II, or III. Expansion joint filler-for use in sidewalk and curbing shall be Type IV.
- D. Reinforcement or other embedded items bonded to the concrete (except dowels in floors bonded on only one side of joint) shall not be permitted to extend continuously through any expansion joint.

## 3.4 INSTALLATION OF JOINTS AND JOINT FILLER

- A. Joint sealant shall be used in all expansion and control joints in concrete unless otherwise specified or shown on the Contract Drawings.
- B. Joint fillers and sealants shall be installed in accordance with manufacturer's recommended procedures and as shown on the Contract Drawings.
- C. Joint filler that will be exposed after removal of forms shall be cut and trimmed to ensure a neat appearance and shall completely fill the joint except for the space required for the sealant. The filler shall be held securely in place and no concrete shall be allowed to enter the joint or the space for the sealant and destroy the proper functions of the joint.
- D. A bond breaker of polyethylene film shall be used between filler and sealant. The joint shall be thoroughly clean and free from dirt and debris and shall receive a light sand blasting before the primer and the sealant are applied. Where the finished joint will be visible, masking of the adjoining surfaces shall be carried out to avoid their discoloration.

- E. The sealant shall be neatly tooled into place and its finished surface shall present a clean and even appearance.
- F. The depth of the sealant shall not exceed the width of the joint.
- G. All sealants used in water retaining structures shall achieve final cure at least seven (7) days before the structure is filled with water.

### 3.5 WATERSTOPS

- A. Waterstops shall be carefully positioned so that they are embedded to an equal depth in concrete on both sides of the joint. They shall be kept free from oil, grease, mortar or other foreign matter. The PVC waterstops shall be braced or supported to maintain them in position prior to placing the concrete.
- B. Splices in PVC waterstops shall be made with a thermostatically controlled heating element. Splices shall be made in strict accordance with the manufacturer's recommended instruction and procedures. At least three satisfactory sample splices shall be made on the site. The sample splices shall be tested in an approved laboratory for strength and watertightness. The splices shall exhibit not less than 80% of the strength of the unspliced material and shall be watertight.
- C. All "T" cross waterstop splices and right angle splices shall be factory fabricated. The Contractor will not be permitted to make these splices in the field.

# 3.6 EXPANSION JOINT FILLER

- A. Expansion joint filler shall be carefully positioned so that top of filler shall be one-half of 1-inch below concrete surfaces, and shall extend to bottom of concrete surfaces.
  - 1. Expansion joint cap, i.e., snap cap shall be slid over the top of the expansion joint filler.
  - 2. Place the concrete and screed to finish grade.
  - When concrete is cured, insert a screwdriver through the top of expansion joint cap, pull free and discard.

4. Apply compatible joint sealant according to joint sealant manufacturer's instructions.

+ + END OF SECTION + +

### SECTION 03300

### CAST-IN-PLACE CONCRETE

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

## A. Scope:

- 1. The General Contractor shall furnish all labor, equipment, materials and services necessary for the manufacture, transportation and placement of all plain, reinforced, and fill concrete work, as shown on the Contract Drawings or as ordered by the Engineer, except for the work specifically included under other items.
- 2. Contractor shall apply chemical hardener to all concrete slabs. Material noted in Section 2.9.

## B. Related Work Specified Elsewhere:

- 1. Section 02200, Earthwork.
- 2. Section 02529, Concrete Curbs, Gutters and Sidewalks
- 3. Section 03100, Concrete Formwork
- 4. Section 03200, Reinforcing Steel.
- 5. Section 03251, Construction Joints.
- 6. Section 05500, Metal Fabrications.
- 7. Section 05503, Fasteners for Miscellaneous Metal Fabrications.

# 1.2 CODES AND STANDARDS

A. Concrete work shall conform to the 2020 New York State Uniform Fire Prevention and Building Code and the latest applicable requirements of the following codes and standards, including all reference therein.

- 1. Code Requirements for Environmental Engineering Concrete Structures ACI 350.
- 2. Building Code Requirements for Reinforced Concrete ACI 318.
- 3. Specifications for Structural Concrete for Buildings ACI 301.
- 4. Placing Concrete by Pumping Methods, ACI 304.2R.
- 5. Guide for Hot Weather Concreting, ACI 305R.
- 6. Guide to Cold Weather Concreting, ACI 306R
- 7. Standard Specification for Curing Concrete, ACI 308.1.
- 8. Standard Specification for Ready- Mixed Concrete, ASTM C 94/C 94M.
- 9. Standard Specification for Chemical Admixtures for Concrete, ASTM C 494/C 494M
- 10. Recommended Practice for Concrete Formwork, ACI 347.
- 11. Manual of Practice for Detailing Reinforced Concrete Structures ACI 315.
- B. Any procedure, materials or operation specified by reference to the American Society for Testing and Materials (ASTM), the American Concrete Institute (ACI), Local Building Code or other reference, shall comply with the requirements of the current and most recent specifications or standards. In conflicts between listed standards and this specification, the more stringent requirements shall govern.
- C. Contractor is expected to obtain the most recent issue of all standards, recommendations, codes or specifications referred to within this specification.

#### 1.3 SUBMITTALS

A. Each submittal shall be identified by the Specification Section No. in Compliance with Section 01342.

- B. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed materials compliance with the Contract Documents.
- C. Partial, incomplete or illegible submissions will be returned to the Contractor without review for resubmission.
- D. Shop Drawings shall include but not be limited to:
  - 1. Formwork Submittals in compliance with Section 03100.
  - 2. Complete reinforcing bar detailing drawings and schedules including compliance with Section 03200.
  - 3. Location plans for all construction joints. Contractor may elect to show this information on the reinforcement detailing drawings as shown on the Contract Drawings, as required, and approved by the Engineer in compliance with Section 03251.

### E. Product Data

- 1. Concrete mix design (for review as to meeting minimum requirements) together with name and location of batching plant at least 28 days prior to the start of concrete work.
  - a. Include test results of proposed concrete proportions based on previous field experience or laboratory trial batches in accordance with ACI 301, Section 4.
  - b. Pumped Concrete: Include test results of proposed design mix(es) tested under actual field conditions with the maximum horizontal run and vertical lift required for this project.
  - c. Concrete mix design shall be signed and sealed by a New York State Professional Engineer with testing results dated within 2 years of the date of submittal.
- 2. Portland Cement: Brand and manufacturer's name.

- 3. Air-entraining Admixture: Brand and manufacturer's name.
- 4. 4. Water-reducing Admixture: Brand and manufacturer's name.
- 5. High Range Water-reducing Admixture (Superplasticizer): Brand and manufacturer's name.
- 6. Corrosion Inhibitor Admixture: Brand and manufacturer's name.
- 7. Accelerating Admixture: Brand and manufacturer's name.
- 8. Aggregates: Name and location of source, and DOT test numbers.
- 9. Lightweight Coarse Aggregates: Brand and manufacturer's name.
- 10. Chemical Hardener (Dustproofing): Brand and manufacturer's name, and application instructions.
- 11. Certifications of compliance with specifications for all sources of each material.
- 12. Transit Mix Supplier.
- 13. Delivery Tickets: Furnish to Engineer copies of all delivery tickets for each load of concrete delivered to the site. Provide items of information as specified in ASTM C 94/C 94M, Article 14 Batch Ticket Information: In addition to the information required by Paragraph 14.1, also include the following:
  - a. Type and brand, and amount of cement.
  - b. Weights of fine and coarse aggregates.
  - c. Class and brand, and amount of fly ash (if any).

# F. Quality Control Submittals

1. The Contractor shall employ an approved commercial testing laboratory at their own expense to provide

field sampling, testing and inspection of all concrete. Continuous inspection by the approved testing laboratory shall be provided during all concrete pours.

- a. Name of independent testing laboratory.
- b. Delivery Tickets
- G. Fresh Concrete Sampling Reports in Compliance with ACI 301, including but not limited to:
  - verifying each truck on arrival to ensure compliance with specifications, and mix design and requirements.
  - 2. Temperature
  - 3. Slump Tests
  - 4. Air Entrainment
  - 5. Concrete Cylinder Compressive Strength Tests

## PART 2 - PRODUCTS

## 2.1 CEMENT

- A. All cement shall be made by a well-known and acceptable manufacturer. Unless otherwise permitted, the product of not more than one plant shall be used in the work. Cement shall be Type II Portland cement and shall conform to the requirements of ASTM Designation C 150. In special cases, when high early strength is desired, Type III Portland cement may be used with the approval of the Engineer. Lumpy, moist or partially set cement, or cement damaged by age or exposure shall not be used. Certified copies of mill reports shall be submitted.
- B. Cement used in the work shall correspond to that upon which the selection of concrete proportions was based. Only one brand of Portland Cement shall be used in the work.

## 2.2 AGGREGATES

- A. Contractor shall submit a new trial mix to the Engineer for review whenever a different aggregate or gradation is proposed.
- B. Contractor shall submit to the Engineer for review, a minimum of two suppliers of aggregates they propose to use.
- C. Contractor shall furnish confirmation to the Engineer that they can obtain 100% of the needed aggregates of the selected gradation from one supplier prior to approval to pour concrete.
- D. Fine Aggregate: Fine aggregate shall conform to ASTM Designation C 33 and consist of natural sand, clean, sharp and free from loam, clay, lumps or other deleterious substances. Sand shall be tested in accordance with ASTM C40. Bank run (material as mined without further processing) will not be allowed.

# E. Coarse Aggregate (Typical):

1. Coarse aggregate shall be strong, clean crushed stone or gravel and a maximum of 1 1/2-inches in diameter. It shall conform to the requirements of ASTM Designation C 33 and the latest revision thereof. It shall be clean, uncoated, processed aggregate free from loam, clay, lumps or other deleterious substances.

# 2.3 WATER

A. Water for use in concrete and mortar shall be from a potable domestic supply and free from injurious amounts of mineral and organic substance.

#### 2.4 ADMIXTURES

A. Admixtures shall be used only when and as specified herein or approved by the Engineer and shall conform to the Specifications of ASTM C 260 or C 494.

- B. Admixtures shall be in accordance with the following:
  - 1. Type-A, a water reducing admixture of the hydroxylated carboxylic acid or the hydroxylated polymer types, conforming to ASTM C 494, WRDA with Hycol as manufactured by GCP Applied Technologies or approved equal.
  - 2. Type-D, a water reducing and retarding admixture conforming to ASTM C 494.
  - 3. Type-E, a water reducing and accelerating admixture conforming to ASTM C 494.
  - 4. Type-F, an air entraining admixture, "Darex II AEA" as manufactured by GCP Applied Technologies, "Sika AER C" by Sika Corporation, or approved equal conforming to ASTM C 260.
  - 5. Integral Water-Repellent Admixture, "Hyrocide Powder" by Master Builders Solutions or "Darapel" by W.R. Grace & Co.
- C. Contractor shall submit manufacturer's descriptive details of admixtures for approval.
- D. Use of accelerating admixtures in cold weather will not relieve cold weather placement requirements.

## 2.5 TESTS OF MATERIAL

- A. Engineer shall have the right to order the test of any material entering into concrete or reinforced concrete to determine its suitability for the purpose. Costs for these tests shall be borne by the Contractor. Tests shall be made in accordance with the requirements of the ASTM. The complete record of such tests shall be available for inspection during the progress of the work.
- B. The Contractor shall provide the services of an independent testing laboratory acceptable to the Engineer. The independent testing laboratory shall measure slump, air entrainment and temperature of the concrete delivered and prepare concrete cylinders for testing. The Contractor shall bear the expense for all testing at no additional cost to the Owner.

# 2.6 PROPORTIONING

- A. Concrete proportions, including water-cement ratio, shall be established on the basis of laboratory trial batches, with materials to be employed, in conformance with Section 4, ACI 301.
- B. Contractor shall develop and submit a series of at least three trial design mixes for each aggregate gradation intended for use to the Engineer for review. A copy of the approved design mix shall be forwarded to the Engineer at least two weeks before delivery of each class of concrete to the job site.
- C. Contractor shall engage an independent testing laboratory in accordance with ACI 211 to attain properties of strength, water-cement ratio, slump, and entrained air content specified. This work shall be paid for by the Contractor.
- D. Trial design mixes of each class of concrete required shall be made in accordance with ASTM C 39 by the testing laboratory. Four standard six inch compression cylinders two tested at 7 and two at 28 days, shall be made in accordance with ASTM C 192 using the materials and proportions proposed for this project.
- E. Certification of aggregates shall be made a part of these tests and referenced on the reports which shall be issued at 7 and 28 days. These tests shall be repeated, if necessary, because of changes in materials or unsatisfactory results.
- F. Quantity of ingredients to use per batch shall be governed by the size of the concrete mixer and the composition of the concrete, but shall not exceed the rated capacity specified for the mixer by the manufacturer of that equipment. Proportion of cement, aggregates, admixtures and water shall be such as to produce a mixture which will be watertight and work readily into the corners and angles of the forms and around reinforcement by methods of placing and consolidation employed on the work, but without permitting the materials to segregate or excessive free water to collect on the surface.

- G. Proportion of cement, aggregates, admixtures, and water used in the concrete shall be based on tests of grading and moisture content of materials, slump of concrete mixture, strength of concrete, and the following factors:
  - 1. Minimum Cement Content, lbs. per cubic yard: 600.
  - 2. Maximum Water-Cement Ratio, by Weight: 0.45.
  - 3. Percent Air Content: 6 + 1 percent.
  - 4. Slump Range: 4 inches maximum.
  - 5. Compressive Strength, lbs. per sq. inch at 28 days F'c = 4000 psi (typical).
  - 6. Compressive strength for concrete fill at 28 days shall be F'c = 4000 psi.
- H. All concrete, unless noted on the Contract Drawing shall be air entrained concrete.

### 2.7 READY-MIXED CONCRETE

- A. Ready-mixed concrete production methods and facilities shall comply with Standard Specifications for Ready-Mixed Concrete, ASTM C 94. Batch deliveries shall not exceed the rated capacity specified for the mixer by the manufacturer of that equipment.
- B. Contractor shall submit affidavits from the ready-mixed concrete supplier certifying that the proposed mix to be supplied satisfies all the requirements under this item and those outlined under "Proportioning." Such affidavits shall be subject to the approval of the Engineer.

### 2.8 EMBEDDED ITEMS

A. Items such as plates, angles, inserts, bolts, and similar items not specified elsewhere shall be provided and installed under this Section unless specified otherwise. All carbon steel embedded items shall be hot dip galvanized after fabrication (unless otherwise noted). All galvanized elements that will be embedded in or will come in contact with concrete and mortar will

require a chromate coating. This coating should be accomplished in the galvanizing plant by either dipping the galvanized elements in a solution of sodium or potassium dichromate acidified with sulfuric acid or spraying this solution on the galvanized surfaces.

B. All aluminum items in contact with concrete and mortar shall receive a bituminous coating such as Bitumastic 300M, by Carboline.

#### 2.9 CHEMICAL HARDENER

A. Chemical hardener shall be Master Kure HD 300WB by Master Builders Solutions, LIQUI-HARD by W.R. Meadows, Inc., or approved equal.

#### 2.10 CONCRETE BONDING AGENT

A. The concrete bonding agent shall be an epoxy-resin bonding type, two component, polyamide type, Sikadur-32 Hi-Mod by Sika Corporation or approved equal.

#### 2.11 CURING

A. Beginning immediately after placement, concrete shall be protected from premature drying in accordance with ACI 301 and 302.1R. Curing by continuous sprinkling or wet mats will be the only acceptable method. Curing compounds will not be acceptable. Wet curing shall continue for a minimum of 7 days.

#### 2.12 GROUT

- A. Type A Nonshrink Grout: The nonshrink, nonstaining grout, shall be "NS Grout" by the Euclid Chemical Company, or "MasterFlow 815" by Master Builders Solutions, or approved equal.
- B. Type B Nonshrink, Epoxy Grout: The nonshrink, epoxy grout shall be "Hi-Flow Grout" by the Euclid Chemical Company, "Sikadur-32 Hi-Mod" Grout by Sika Corporation, or "Axpandcrete S Hi-Flow" by Anti-Hydro International, Inc., or approved equal.

### 2.13 FINISH AND REPAIR COMPOUNDS

A. Finish and repair compounds shall be "Tammspatch II" by Euclid Chemical Company, "SikaTop" by Sika Corporation, or approved equal.

### PART 3 - EXECUTION

#### 3.1 COMPRESSION TEST CYLINDERS

- A. The Contractor shall perform, control and pay for all tests specified herein. All testing shall be performed by an independent testing laboratory acceptable to the Engineer and in accordance with procedures specified herein. Contractor shall bear the expense for the independent testing laboratory at no additional cost to the Owner. Contractor shall give the Engineer a minimum of 24 hours' notice prior to concrete placement after all other requirements of these specifications have been met.
- B. Strength tests shall conform to ASTM C 172 for sampling, ASTM C 31 for making and curing test cylinders and ASTM C 39 for testing. Four field cured test cylinders of concrete for each 50 cubic yards or fraction thereof or for each placement shall be made, whichever is less, as directed by the Engineer. One specimen shall be broken at 7 days and the remainder at 28 days.
- C. Slump and air content tests shall conform to ASTM C 143 for slump and ASTM C 231 (pressure method for air content). Each test shall be made whenever strength specimens are made and as often as necessary for control and acceptance purposes and as required by the Engineer.
- D. Additional specimens shall be made when the Contractor desires approval of form removal earlier than set forth under "Removal of Forms" later in this section. Requests for testing of additional specimens shall require approval of the Engineer.

## 3.2 CONSISTENCY

A. Consistency of the concrete shall be checked by the Engineer by standard slump cone tests. Maximum slump shall be 4 inches. Contractor shall upon written order

suspend all pouring operations in the event the consistency does not meet the intent of the specifications. No payment shall be made for any delays, material or labor costs due to such eventualities.

B. The approved consistency of the concrete mix shall at all times be as stiff or dry as is practicable, considering the particular type of work being done and the necessity of obtaining a dense, impervious, watertight concrete. Thin or wet mixes as a substitute for proper placing facilities or adequate placing labor will not be permitted, nor will the appearance of free water in the forms.

### 3.3 MIXING CONDITIONS

- A. All Batching and Mixing shall conform to the following and the ACI 304, "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
- B. Concrete shall be mixed only in such quantities as required for immediate use. No concrete shall be mixed while the air temperature is below 40°F, without permission of the Engineer. If permission is granted for mixing concrete under such conditions, the work shall be in accordance with ACI 306, latest edition, "Guide to Cold Weather Concreting" and the aggregates or water, or both if required, shall be heated and temperature of the concrete, when placed, shall not be less than 70°F, nor more than 100°F.

# C. Hot Weather Placing:

- When hot weather conditions exist that would seriously impair the quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
- 2. Cool ingredients before mixing to maintain concrete temperature at time of placement below 80°F when the temperature is rising and below 85°F when the temperature is falling. Mixing water may be chilled, or chopped ice may be used to control the concrete temperature provided the water equivalent of the ice is calculated in the total amount of mixing water.

- 3. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that the steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
- 4. Wet forms thoroughly before placing concrete.
- 5. Do not place concrete at a temperature so as to cause difficulty from loss of slump, flash set, or cold joints.
- 6. Do not use set-control admixtures unless approved by the Engineer in mix designs.
- 7. Obtain Engineer's approval of other methods and materials proposed for use.
- C. Retempering of concrete by adding water or other materials will not be permitted.
- D. No foundation concrete shall be placed in water or frozen ground.

### 3.4 PLACING CONCRETE

- A. Before any major concrete pour is started, Contractor shall prepare and submit to the Engineer for approval a schedule of their proposed operations. Approval of the schedule by the Engineer shall not relieve the Contractor of their responsibility for producing concrete work of the highest quality.
- B. No foundation, slab or pavement concrete shall be placed until the depth and character of the foundation soils have been inspected by the contractors third party testing laboratory and approved by the Engineer. Contractor shall coordinate work with the requirements of Section 02200, Earthwork. No concrete shall be placed until all reinforcing steel, anchor bolts, pipes, conduits, sleeves, and other work required to be built into concrete have been inspected and approved by the Engineer. All concrete shall be placed during the daylight hours except with the consent of the Engineer; the placing of concrete in any portion of the work shall not be started unless it can be completed in daylight. If special permission is obtained to carry on work during

- the night, an adequate floodlight system must be provided.
- C. Concrete shall not be placed on or in standing water. All water shall be removed from excavations and forms prior to the placement of fresh concrete.
- D. Concrete shall be placed in forms as soon as practicable after mixing, and in no case shall concrete be used which does not reach its final position in the forms within 1-1/2 hours after truck mixed concrete leaves the plant as evidenced by the delivery ticket given to the concrete inspector.
- Ε. The method and manner of placing concrete shall be such as to avoid the possibility of segregation, loss of ingredients or the displacement of the reinforcement. Tempering of concrete will not be permitted. Concrete shall be deposited as close as practical to its final position to avoid segregation and rehandling or flowing. When troughs or chutes are used in placing concrete, their angle of inclination shall not exceed 1 vertical to 2 horizontal with respect to the horizontal. When pipes are used, they shall be kept full of concrete and have their lower ends buried in fresh concrete; such pipes shall be used in the same manner as a tremie. All chutes, troughs and pipes shall be kept clean and free from coatings of hardened concrete. Open troughs or chutes shall be metal or metal-lined, and shall extend as nearly as possible to the point of deposit. When the discharge must be intermittent, a hopper or other device for regulating the discharge shall be provided.
- F. Dropping the concrete a distance of more than 4 feet or depositing a large quantity at any point, running or working it along the forms will not be permitted.
- G. Placing of concrete shall be so regulated that the pressure caused by the wet concrete shall not exceed that used in the design of the forms.
- H. All concrete shall be deposited in approximately horizontal layers not deeper than 18-inches. Each part of the form shall be filled by placing the concrete as near to its final position as possible. The coarse aggregate shall be worked back from the face and the

- concrete forced under and around the inserts, piping and reinforcing bars without disturbing them.
- I. All concrete shall be consolidated by continuous working with suitable tools and also by the use of approved mechanical vibrating devices (10,000 vibrations per minute minimum). All formed faces shall be well spaced and the mortar flushed to the surface.
- J. Mechanical vibrators shall be an approved type transmitting vibrations directly to the concrete with sufficient intensity to cause flow and settlement. Their operation shall be carefully controlled to give sufficient duration to accomplish thorough compacting without overagitation which will cause segregation of the materials. Every effort shall be made to ensure that all concrete work is solid, compact, watertight, and smooth to prevent the formation of laitance.
- K. The various pours shall be planned and executed to ensure that once started the placing of concrete in a pour shall be continuous and in a manner until placement of the panel or section is complete to prevent any initial set from starting in any concrete before fresh concrete is placed against it. Should placing of concrete be suspended or unavoidable interrupted once a pour has started, provide bulkheads and keyways at formed surface at which to stop pour.
- L. Place concrete continuously between predetermined expansion, control and construction joints.
- M. After the concrete has acquired its initial set, care shall be exercised to avoid jarring forms or placing any strain on the ends of projecting reinforcing bars.
- N. Bonding for Next Concrete Pour: Roughen surfaces of set concrete at all joints, except where bonding is obtained by use of a concrete bonding agent. Clean surfaces of laitance, coatings, loose particles, and foreign matter. Roughen surfaces in a manner to expose bonded aggregate uniformly and to not leave laitance, loose particles of aggregate, or damaged concrete at the surface.
- O. Bonding of fresh concrete to fully-cured hardened concrete or existing concrete shall be accomplished by using an epoxy-resin bonding agent.

## 3.5 PROTECTION AND CURING

- A. Careful attention shall be given to the proper curing and protection of all concrete in the structures. The Work shall be protected from the elements, flowing water and from defacement of any nature during construction operations.
- B. After placing and finishing of concrete, concrete shall be cured and protected in accordance with ACI 308R, and as stated below.
  - 1. Curing Methods:
    - a. Perform curing of concrete by moist curing, or by moisture retaining cover curing.
    - b. For curing, use water that is free of impurities which could etch or discolor exposed, natural concrete surfaces.
  - 2. Provide moisture curing by any of the following methods:
    - a. Keeping the surface of the concrete continuously wet by covering with water.
    - b. Continuous water-fog spray.
    - c. Covering the concrete surface with the specified absorptive cover, thoroughly saturating the cover with water, and keeping the absorptive cover continuously wet with sprinklets or porous hoses. Place absorptive cover so as to provide coverage of the concrete surfaces and edges, with a 4-inch lap over adjacent absorptive covers.
  - 3. Provide moisture retaining cover curing as follows:
    - a. Cover the concrete surfaces with the specified moisture retaining cover for curing concrete, placed in the widest practical width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during

the curing period using cover material and waterproof tape.

# C. Curing Formed Surfaces:

- 1. Cure formed concrete surfaces, including the undersides of girders, beams, supported slabs and other similar surfaces by moist curing with the forms in place for the full curing period or until forms are removed. If forms are removed, continue curing by method specified above.
- D. Temperature of Concrete During Curing:
  - 1. Cold weather protection shall conform to ACI 306R.
    - a. Prior to pouring, it shall be the Contractor's responsibility to keep the forms free from snow, ice, mud, debris at all times, by means of covers, enclosures, steam or heating below the forms as necessary. Use of torches, open flames, slats, straw, hay or chemical is prohibited.
    - b. When the atmospheric temperature is 40°F and below, maintain the concrete temperature between 50°F and 70°F continuously throughout the curing period. When necessary, make arrangement before concrete placing for heating, covering, insulation or housing as required to maintain the specified temperature and moisture conditions continuously for the concrete curing period. Provide cold weather protection complying with the requirements of ACI 306.
    - c. Concrete shall not be poured on frozen soil. After pouring, protect against freezing and heaving of subgrade. Any frozen concrete will be rejected and removed at the Contractor's expense. Accelerating admixtures shall not be accepted in lieu of winter protection.
    - d. When the concrete is placed in air temperatures of  $40^{\circ}$  or lower the concrete

shall be heated as described under Item 3.3 Mixing Conditions.

- 2. Warm weather protection shall be conform to ACI 305R.
  - a. When the atmospheric temperature is 80°F and above, or during other climatic conditions which will cause too rapid drying of the concrete, make arrangements before the start of concrete placing for the installation of wind breaks or shading, and for fog spraying, wet sprinkling, or moisture retaining covering. Protect the concrete continuously for the concrete curing period. Provide hot weather protection complying with the requirements of ACI 305, latest edition, unless otherwise specified.
  - b. During warm weather special care and precautions should be taken to prevent premature setting which may cause shrinking and surface cracking. No concrete shall be placed at temperatures above 90°F without the approval of the Engineer.
- 3. Maintain concrete temperature as uniformly as possible, and protect from rapid atmospheric temperature changes. Avoid temperature changes in concrete which exceed 5°F in any one hour and 50°F in any 24 hour period.
- 4. No water (except curing spray) shall be allowed to come into contact with the concrete or masonry surface for a minimum of 24 hours. Should the rising water place a stress on the concrete, proper bracing shall be provided. Loading shall not occur without prior approval by the Engineer, and proper safety precautions shall be the responsibility of the Contractor.
- E. Protection from Mechanical Injury: During the curing period, protect concrete from damaging mechanical disturbances including load stresses, heavy shock, excessive vibration, and from damage caused by rain or flowing water. Protect all finished concrete surfaces from damage by subsequent construction operations.

- F. The concrete shall be protected during transit, and before and after placing, as directed by the Engineer, to retain all heat possible in the concrete mix.
- G. After the concrete has been placed, it shall be enclosed and protected so as to maintain the temperature of the concrete at not less than 50°F until 70 percent of the designated strength has been attained, as indicated by cylinder tests.
- H. Finished surfaces and wall edges located where travel and further construction work is necessary shall be suitably protected from damage by temporary guards or covers as directed by the Engineer.

# 3.6 QUALITY OF CONCRETE WORK

- A. Make all concrete solid, compact and smooth, and free of laitance, cracks and cold joints.
- B. All concrete for liquid retaining structures, and all concrete in contact with earth, water, or exposed directly to the elements shall be watertight.
- C. Cut out and properly replace to the extent ordered by the Engineer, or repair to the satisfaction of the Engineer, surfaces which contain cracks or voids, are unduly rough, or are in any way defective. Thin patches or plastering will not be acceptable.
- D. All leaks through concrete, and cracks, holes or other defective concrete shall be repaired and made watertight by the Contractor.
- E. Repair, removal, and replacement of defective concrete as ordered by the Engineer shall be at no additional cost to the Owner.
- F. Tolerances and criteria delineated in ACI 301 shall be strictly adhered to.

## 3.7 ADMIXTURES

A. When directed or approved by the Engineer, an admixture shall be added to the concrete to control the rate of hardening and workability. Admixture shall be of the

retardant type under high temperatures and the accelerating type under low temperatures. The admixture shall be added to the mix at the batch plant and the proportions shall be in strict accordance with the manufacturer's recommendations.

- Concrete retardant shall be used to expose aggregate and В. to provide the concrete with rough bonding surfaces at all horizontal construction joints. Apply retardant on forms or spray on unformed horizontal construction joints in strict accordance with manufacturer's directions. Remove all unset mortar by wire brushing or with a water jet within the time limit specified by the manufacturer. In lieu of the above method of exposing aggregate, a water blast or sand blast method may be used for vertical and horizontal surfaces. Contractor must satisfactorily demonstrate, on sample panels, that the proposed method can achieve an etch of 1/8-inch, minimum.
- C. Use air entraining admixture in all concrete, except interior slabs subject to abrasion, unless otherwise shown or specified. Add air entraining admixture at the manufacturer's prescribed rate to result in concrete at the point of placement having air content within the prescribed limits.

## 3.8 CONSTRUCTION, CONTROL AND EXPANSION JOINTS

A. Construction, Control and expansion joints shall be located as shown on the Contract Drawings and as specified in Section 03251.

## 3.9 SLABS ON GROUND

- A. The subgrade for slabs on ground shall be well drained and of adequate and uniform load bearing nature. The in-place density of the subgrade soils shall be at least the minimum required in the specifications. The bottom of an undrained granular base course shall not be lower than the adjacent finished grade.
- B. The subgrade shall be free of frost before concrete placing begins. If the temperature inside a building where concrete is to be placed is below freezing it shall be raised and maintained above 50°F long enough to remove all frost from the subgrade.

- C. The subgrade shall be moist at the time of concreting. If necessary, it shall be dampened with water in advance of concreting, but there shall be no free water standing on the subgrade nor any muddy or soft spots when the concrete is placed.
- D. Provide control joints in slabs-on-grade at locations indicated on the drawings. Control joints may be construction joints or sawed joints (cut 1/4 of the slab depth). Saw cuts for control joints shall be performed within 24 hours after the concrete is placed. For floors receiving floor coverings, joints may be made by insertion of fiberboard strips (1/4 of the slab depth) into the unset concrete. Wire mesh or reinforcement shall be interrupted 2 inches clear each side of sawed or impressed control joints.
- E. Floor slabs shall be screeded level or pitched to drain as indicated on the Drawings. Slabs to be finished as specified in Item 3.14 hereinafter.

#### 3.10 CONCRETE FINISH

- A. After the forms are removed, all concrete surfaces shall be inspected, and any poor joints, voids, stone pockets or other defective areas noted by the Engineer shall be repaired immediately at the Contractor's expense by cutting away the unsound area to a minimum depth of 1 inch, and refilling with mortar mixed using the same brand of cement as the original pour. Edges of the patch shall be square with the face, with feather-edging prohibited. Obtain approval of corrective action prior to repair.
- B. Care shall be taken to saturate the patched area and holes shall be filled in 1/2-inch layers with a delay for an initial set to take place before the succeeding layer is applied. If, in the opinion of the Engineer, improper consolidation is too extensive, or if the structure appears weakened by the voids, complete removal of the concrete in question may be required. Patches shall be kept moist for a minimum of three days.
- C. Rubbed finishes shall be as follows:

- 1. Type A: Surfaces shall be rubbed until all marks are obliterated and a uniformly smooth finish, texture and color are obtained.
- 2. Type B: Surfaces shall be rubbed until they are uniformly smooth, but the complete obliteration of all marks is not required.
- 3. Type C: All fins, burrs and projections shall be removed, any honey- comb or tie-holes shall be filled and patched.
- 4. The type of finish to be used shall be as scheduled or as noted on the Drawings. Where the type of finish is not shown or scheduled, exposed faces shall be given a Type B finish and unexposed faces shall be given Type C finish.
- 5. Rubbing shall begin as soon as practicable after removal of forms and shall be expedited to completion as rapidly as practicable.
- 6. Surfaces shall be rubbed with carborundum and water until all fins, bubbles, hollows and other defects are removed. Grout or mortar shall not be used in the rubbing process, and plastering of surfaces will not be permitted. Power tools shall be used for rubbing with hand work limited to inaccessible corners or very small areas.
- D. Unless otherwise called for or shown on the Contract Drawings all exposed edges shall have a 1-inch chamfer.
- E. All concrete surfaces that are exposed in the completed work to the atmosphere or to water shall be finished as specified herein. Immediately after removal of forms, finishes as hereinafter specified shall be applied.
  - 1. Formed Vertical Faces:
    - a. All exposed vertical faces of formed concrete shall be prepared for the specified finish as follows. Remove all forms in such manner as to prevent damage to the concrete and at the proper time for the required finish.

- b. Point up all areas, remove any projections and fins, repair all honeycomb as permitted and approved by the Engineer, and fill in all tie holes. Mortar used for filling and repairs shall be of the proper consistency and of the same color as the adjacent concrete. Any pointing up and repair not consistent with these specifications or approved by the Engineer shall be redone at no extra cost to the Owner.
- c. As an alternative to the rubbed finish, a grout finish shall be used on the interior walls of water retaining structures, all exposed exterior and interior vertical and formed faces of concrete, unless otherwise noted or specified.
- d. The grout finish on walls shall be carried at least 12 inches below finished grade or to the floor slab in case of interior wall faces.
- After the pointing has been sufficiently set е. to permit it, the grout finish shall be applied in the following manner: The concrete surface shall be thoroughly moistened (but not soaked and no free water shall be standing) and the entire surface painted with a sandcement wash. The wash shall be composed of one part of Portland cement, of which portion approximately 33 percent shall be Portland cement, and 1 to 1 1/2 parts fine clean sand passing a No. 30 sieve. The grout shall be of such consistency that it will not run when applied to vertical surfaces, and so that it will fill all voids in the surface of the concrete. The sand-cement wash shall be applied with a brush and thoroughly worked into the concrete at a rate that will completely fill all voids in the surface of the concrete and provide a firm even texture uniform in color. After the wash has started to harden slightly, but before it has taken its initial set, any excess material shall be removed with a straight edge, and in about an hour, the surface shall be rubbed with a rough cloth or pad to remove the excess wash

entirely from the surface and leave the voids filled. The wash shall be applied without a break in application (time lapse sufficient to allow wash to set up) in any wall, beam or column face except at corners, edges or other offsets. Prior to final approval of the work, any surface which has been disfigured by drippings or other causes shall be thoroughly cleaned, using a weak solution of muriatic if acid, necessary, and arout application repeated as required. The entire grout finish operation shall be accomplished using a single brand of Portland cement and a single source of sand throughout the Project.

### 2. Unformed Horizontal Surfaces:

- a. All exterior horizontal concrete surfaces shall be screeded and then worked to a true, smooth surface with wood floats and proper edging or jointing tools.
- b. All interior concrete floors and slabs shall receive a swirl finish.
- c. Provide smooth form finish for all interior and exterior exposed beams and undersides of slabs.
- d. Floors shall have the aggregate well worked down from the surface and be given a hard, smooth steel trowel finish. After the hard, smooth finish is obtained, the finisher shall make an additional pass over the surface to obtain a nonskid finish, commonly known as a "swirl finish" which is smoother than "sidewalk finish" but is not of a glass like smoothness.
- e. Dusting with sand or cement will not be permitted.
- f. Paint, silicone damp-proofing or other coatings or substances shall not be applied to surfaces or adjoining joint surfaces until sealants have been installed and are nominally cured.

g. Concrete and Masonry Joint Surfaces: Etch bonding surfaces with a 5 percent solution of muriatic acid, rinse thoroughly with water, and dry.

# 3. Floor and Slab Finishing:

- a. Finished floors and slabs shall be level to within 1/8" of finish floor elevation in ten feet. If this variation occurs, it must not be abrupt, but must taper so that the 1/8" variation takes place in not under 4 feet. Areas with drains shall have the surfaces sloped uniformly and true to the effect that no surface ponding occurs. If required by the Engineer, replace, grind or furnish underlayment to correct the variation, at the Contractor's expense. All floors and slabs shall be cured and protected as specified.
- b. Trowelled Finish: Provide a floated finish, followed by a power troweling and then a hand troweling thoroughly consolidating the surface. Provide a finished surface essentially free from trowel marks and uniform in texture and appearance.
- c. Where exposed concrete finish is specified, provide a swirl finish.
- d. Float Finish: A float finish shall be applied to all exterior concrete and those areas not intended for occupancy, such as culvert inverts, bottoms of manholes and catch basins, pads, etc.
- e. Broom Finish: Provide a floated finish. While the surface is still plastic, provide a textured finish by drawing a fiber bustle broom uniformly over the surface in one direction only. Provide "medium" texturing unless noted otherwise on the Contract Drawings. Sidewalks, walkways, or exterior ramps shall be given a broom finish, perpendicular to traffic, sufficient to leave

marks without appreciable disturbance of the surface.

#### 3.11 CUTTING AND PATCHING

A. Where concrete areas are to be patched, the perimeter of the area is to be saw cut, and all deteriorated concrete is to be removed to a minimum depth of at least 3/4 inch behind the exposed reinforcing. The perimeter of the saw cut area shall be under cut all around. Any exposed reinforcing shall be spliced by lap welding where more than 25% of the cross sectional area of the rebar is lost. The exposed concrete and reinforcing shall then be sandblasted. The concrete surface now exposed shall be moistened and exposed reinforcing shall be cured with an anticorrosion, cementitious coating, (SikaTop Armatec-110 or approved equal). The saw cut area shall be filled to match the level of the existing surface with repair mortar (SikaTop 122 Plus or approved equal) and cured with a membrane covering.

# 3.12 EQUIPMENT FOUNDATIONS

All equipment pads and foundations not otherwise noted on the drawings or in this specification shall be formed, reinforced and poured to the dimensions shown. All exposed surfaces except those surfaces subsequently required to receive grout and support equipment bases shall, unless otherwise noted elsewhere in the project specification, be finished as detailed in ACI 301, Section 5, to a "smooth form finish." Exterior angles shall be chamfered. Contractor shall build in all anchor bolts, sleeves and other built-in fittings as required for the equipment. Surfaces which will later receive grout shall, before the concrete takes its final set, be made rough by removing the sand and cement that accumulates on the top to the extent that the aggregate will be exposed with indentations in the surface of 1/2 inch and irregular.

## 3.13 GROUT

### A. Applications:

1. Type A - Nonshrink Grout Mix A - Nonshrink Grout shall be used for the setting of structural items such as base plates for columns and beams,

equipment and other machinery. All grout shall be mixed and placed in strict accordance with the directions of the manufacturer.

2. Type B - Nonshrink, Epoxy Grout Mix B - Nonshrink, Epoxy Grout shall be used for sloping floors (prior to installing Heavy Duty Floor Toppings), the setting of handrail posts, and around new openings, reinforcing bar dowels into existing concrete, piping, and plain opening in existing walls or where indicated on the Contract Drawing. All grout shall be mixed and placed in strict accordance with the directions of the manufacturer.

# B. Preparation:

- 1. The underside of the base plate for columns and beams, equipment and other machinery shall be cleaned of all dirt, grease and oil-like films.
- The pertinent concrete surfaces shall likewise be 2. cleaned of all similar contamination and debris, chipping or roughening the surface if any laitance or poor concrete is in evidence. Special care shall be taken with the grout in hot or cold weather to ensure proper setting and gain of strength. Aggravating conditions of placement are to be alleviated to an extent that the temperature of the grout up until time of set will be about the range of 60° to 80°F. Ice or hot water may be used and shields from the sun and hot winds shall be provided when required. Following cleaning, the concrete shall be water saturated for a period of 6 hours, the excess water then removed from the surface and nonabsorbent edge forms erected.

# C. Grouting:

1. Grout shall be placed quickly and continuously, shall completely fill the space to be grouted and be thoroughly compacted and free of air pockets. The grout may be poured in place, pressure grouted by gravity, or pumped. The use of pneumatic pressure or dry-packed grouting requires approval of the Engineer. Whenever practical, grout shall be poured from one side only and thence flow across to the open side to avoid air entrapment.

## D. Finishing:

1. If an expanding grouting aid is used, the recommendations of the manufacturer on finishing of exposed edges shall be strictly followed. All visible wedges shall be removed 48 or more hours after the grout has been placed.

# 3.14 CONCRETE THRUST BLOCKS/SUPPORTS

A. General: The Plumbing Contractor shall provide, poured concrete thrust blocks and supports at all changes in direction and as shown on the Drawings. Concrete thrust blocks and support piers shall be poured between solid ground and the fitting to be supported. The thrust blocks shall conform to the dimensions shown on the Contract Drawings or as approved by the Engineer and shall be so placed that pipe and fitting will be accessible for repair.

+ + END OF SECTION + +

#### SECTION 03353

#### STAMPED CONCRETE

#### PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Integrally colored and color-hardened Portland cement concrete paving with imprinted pattern and stain/sealer treatments.

#### 1.2 REFERENCES

- A. ACI 303 Guide to Cast-in-Place Architectural Concrete Practice.
- B. ACI 305R Hot Weather Concreting.
- C. ACI 306R Cold Weather Concreting.
- D. ACI 308 Standard Practice for Curing Concrete.
- E. ACI 309 Standard Practice for Consolidation of Concrete.
- F. ACI 347 Guide to Formwork for Concrete.
- G. ACI 503 Standard Specification for Bonding Plastic Concrete to Hardened Concrete with a Multi-Component Epoxy Adhesive.
- H. ASTM C33 Standard Specifications for Concrete Aggregates.
- I. ASTM C150 Standard Specifications for Portland Cement.
- J. ASTM C260 Standard Specifications for Air-Entraining Admixtures for Concrete.
- K. ASTM C309 Standard Specifications for Liquid Membrane Forming Compounds for Curing Concrete.
- L. ASTM C494 Standard Specifications for Chemical Admixtures for Concrete.
- M. ASTM C881 Standard Specifications for Epoxy-Resin-Base Bonding Systems for Concrete.
- N. ASTM C94 Standard Specification for Ready-Mixed Concrete.

- O. ASTM C206 Standard Specification for Finishing Hydrated Lime.
- P. ASTM C233 Standard Test Method for Air-Entraining Admixtures for Concrete.
- Q. ASTM C920 Standard Specification for Elastomeric Joint Sealants.
- R. ASTM C979 Standard Specification for Pigments for Integrally Colored Concrete.
- S. ASTM C1059 Standard Specification for Latex Agents for Bonding Fresh To Hardened Concrete.
- T. ASTM C1077 Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
- U. ASTM D1751 Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- V. ASTM D1752 Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
- W. ASTM E329 Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
- X. ASTM E548 Standard Guide for General Criteria Used for Evaluating Laboratory Competence.

### 1.3 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.

### B. Testing:

 Submit proposed mix design for each class of concrete for review prior to commencement of work.

- 2. Testing firm will take cylinders and perform slump and air entrainment tests in accordance with ACI 301.
- 3. Four concrete test cylinders will be taken for each class of concrete placed each day.
- 4. One slump test will be taken for each set of test cylinders taken.

## 1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
- B. Installer Qualifications:
  - 1. The Installer shall provide a qualified foreman or supervisor who has a minimum of three years' experience with imprinted and textured concrete, and who has successfully completed at least five imprinted concrete installations of high quality and similar in scope to that required.
  - 2. The concrete is cast in place, on the job site, by trained and experienced workmen who shall be employed by a firm that is a licensed and certified Imprint Licensed Contractor
  - 3. Perform work in accordance with ACI 301, 302, 303.
  - 4. Obtain materials from same source throughout.
  - 5. Conform to applicable codes and regulations for paving work performed within the public right of way.
- C. Ready-Mixed Supplier Qualifications: Supplier of ready-mixed concrete products shall comply with ASTM C 94 requirements for production facilities and equipment. Supplier shall be certified according to NCRMA's "Certification of Ready Mixed Concrete Production Facilities Quality Control Manuals."
- D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- E. Mock-Up: Provide field samples of surface colors textures and patterns specified for architect approval prior to beginning work, 48 inches by 48 inches (1219 mm by 1219 mm) in size illustrating paving finishes.

- 1. Finish areas designated by Architect.
- 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
- 3. Refinish mock-up area as required to produce acceptable work.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

## 1.6 PROJECT CONDITIONS

- A. Do not place pavement when base surface or ambient temperature is less than 40 degrees F (4 degrees C) or if base surface is wet or frozen.
- B. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

# 1.7 WARRANTY

A. All materials manufactured are warranted to be of uniform quality within manufacturing tolerances.

#### PART 2 PRODUCTS

## 2.1 MANUFACTURERS

- A. Basis-of-Design Manufacturer: Gruttadaurio Masonry, LLC.; 4182 Dean Rd, Marion, NY 14505. Tel: (315) 310-7193. Email: <a href="info@gruttadauriomasonry.com">info@gruttadauriomasonry.com</a>. Web: http://www.gruttadauriomasonry.com
- B. Acceptable Manufacturer: The Bomanite Company; 8777 Auburn Folsom Rd #108, Granite Bay, CA 95746. ASD. Tel: (303) 369-1115. Fax: (303) 291-0282. Email: info@bomanite.com. Web: http://www.bomanite.com.
- C. Requests for substitutions will be considered.

### 2.2 SYSTEM

# A. Supporting Structure:

# 1. Mix Design:

- a. Mix and deliver concrete in accordance with ASTM C94, Alternate 2. Refer to Drawings for concrete strength requirements.
- b. Use accelerating admixtures containing no calcium chloride in cold weather only when approved by testing laboratory. Use of admixtures will not relax cold weather placement requirements.
- c. Use set retarding admixtures during hot weather only when approved by testing laboratory.
- d. Add air entraining agent to concrete mix for concrete work exposed to exterior, in amounts of 4 to 7 percent of total concrete volume or as otherwise recommended by testing laboratory.
- e. Add coloring admixture where scheduled in quantities recommended by coloring admixture manufacturer to achieve selected color.
- f. Add polypropylene fiber reinforcement at point of concrete batching at rate scheduled.
- g. Maintain water cement ratio to produce a minimum of 3 to maximum of 5-inch slump.
- h. Use of calcium chloride is strictly prohibited.

### 2. Subbgrade:

a. Refer to drawings for scope of subgrade preparation.

### 3. Reinforcement:

- a. Fiber Reinforcement: ASTM C948, collated, fibrillated, 3/4 inch (19 mm) long virgin polypropylene fibers
- b. Reinforcing Steel: ASTM A615; Grade 60; deformed billet steel bars, uncoated finish.

c. Welded Steel Wire Fabric: Plain type, ANSI/ASTM A185; in flat sheets; uncoated finish.

#### B. Color:

# 1. Integral Color:

- a. Integral Coloring Admixture: Integral Color, synthetic oxide pigment, meeting ASTM C979 and C494.
  - 1) Type A, cement dispersing/water
     reducing.
  - 2) Type D, set retarding/water reducing.
  - 3) Color to match Architect's sample, as indicated on contract drawings.
  - 4) Pattern: as indicated on contract drawings.

# 2. Color Hardener:

a. Color Hardener: The concrete shall be colored with Color Hardener. Color(s) as scheduled. Refer to Drawings.

# C. Tools Selection:

- 1. Imprinting Tools:
  - a. Mat type imprinting tools for texturing freshly placed concrete, in pattern/texture as selected by Architect or as scheduled.
  - b. Imprinting tools used in the execution of this project shall be manufactured by a manufacturer approved equal to Bomanite.
- 2. Patterns: Design(s) as scheduled. Refer to Drawings.

# D. Cure Agent:

- 1. Membrane Color Cure: Color(s) as scheduled. Refer to Drawings.
  - a. Curing Compound: Meeting ASTM C309, waterbased emulsion.
- 2. Silicate Cure & Densifier:

- a. The concrete shall receive a cure treatment.
- E. Sealing and Finish Coatings:
  - 1. Colorwax by The Bomanite Company or approved equal.
  - 2. Hydrolock by The Bomanite Company or approved equal.
  - 3. VOC II by The Bomanite Company or approved equal.

# 2.3 RELATED MATERIALS

- A. Cement: ASTM C150, type 1, Portland cement, gray color.
- B. Fine and Coarse Aggregates: ASTM C33.
- C. Water: Clean and not detrimental to concrete.
- D. Form Material: Conform to ACI 301. If using metal, material shall be free from deformities. If using wood, use construction grade lumber, sound and free of warp, minimum 2 inches (51 mm) nominal thickness, except where short radii of curves require thinner forms.
- E. Contraction Joint Devices: Galvanized sheet metal, keyed profile, with knock-outs for reinforcing and dowel steel.
- F. Tie Wire: Annealed steel, minimum 16 gage (1.519 mm)
- G. Dowels: ASTM A615; Grade 40, plain steel, uncoated finish.
- H. Miscellaneous Reinforcing Accessories: Spacers, chairs, ties, and other devices necessary for properly placing, spacing, supporting, and fastening reinforcement in place.
- I. Form release agent: As acceptable to concrete colorant manufacturer, non-staining, dissipative type.
- J. Vapor Retarding Membrane: 10 mil (.2540 mm) reinforced polyethylene.
- K. Air-Entraining Admixture: ASTM C 206. Air Entrained Concrete shall be used wherever concrete is exposed to the freezing weather. Proportions of entrained air, as determined by ASTM C233, and C260, shall be as follows:

1. Aggregate: 3/8 inch (9.5 mm) maximum size aggregate 6-8 percent entrained air.

### L. Joint Fillers:

- 1. Redwood Boards: Construction heart grade redwood, sound and free of checks, splits or other defects, 3/4 inch (19 mm) thick.
- 2. Asphaltic Joint Filler: Asphalt impregnated fiberboard, ASTM D1751, 1/2 inch (12 mm) thick.
- 3. Non-Asphaltic Joint Fillers: ASTM D1752, Type I.
- M. Sealants: Two part polyurethane sealants, of grade as required to suit application, meeting ASTM C920, in manufacturer's custom colors.
  - 1. Urethane, SL grade, as specified in Section 07920.
  - 2. Urethane, SL-TB grade as specified in Section 07920.
- N. Bonding-Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene rubber.
- O. Epoxy-Bonding Adhesive: ASTM C 881, two component epoxy resin, capable of humid curing and bonding to damp surface, of class and grade to suit requirements if required, and as follows: Types I and II, non-load bearing, for bonding hardened of freshly mixed concrete to hardened concrete.

#### PART 3 EXECUTION

# 3.1 INSPECTION

- A. Verify compacted subgrade is ready to support paving and imposed loads, free of frost, smooth and properly compacted.
- B. Verify gradients and elevations of base are correct, and proper drainage has been provided so water does not stand in the area to receive paving.
- C. Beginning of installation means acceptance of existing conditions.

#### 3.2 PREPARATION

- A. If vapor retarding membrane is not used, moisten base to minimize absorption of water from fresh concrete.
- B. Notify Architect and testing laboratory, minimum 24 hours prior to commencement of concreting operations.

# 3.3 FORMING

- A. Construct and remove forms in accordance with ACI 347.
- B. Place and secure forms to correct location, dimension, and profile. Adequately brace to withstand loads applied during concrete placement.
- C. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- D. Place joint fillers vertical in position, in straight lines. Secure to formwork during concrete placement.

# 3.4 INSERTS AND ACCESSORIES

- A. Make provisions for installation of inserts, accessories, anchors, and sleeves.
- B. Place vapor retarder continuously over subgrade. Overlap joints a minimum of 12 inches (305 mm) and seal with a joint tape of same permeance as sheeting material.

# 3.5 REINFORCEMENT

- A. Accurately place reinforcement in middle of slabs-on-grade.
- B. Discontinue every other bar of reinforcement at control and expansion joints.
- C. Place reinforcement to achieve slab and curb alignment as detailed.
- D. Steel shall be free of rust, mill scale, dirt and oil.
- E. Provide doweled joints at interruptions of concrete with one end of dowel set in capped sleeve to allow longitudinal movement. Provide support at both ends of dowels.
- F. Support reinforcing on bar chairs. Securely saddle tie at intersections. Rigidly secure in place to minimize displacement during concrete pour.

#### 3.6 JOINTS

- A. Intentional stoppage of concrete placing shall be at planned location of either an expansion joint or contraction joint.
- B. When stoppage occurs at an expansion joint, install joint assembly with a bulkhead of sufficient section drilled to accommodate required dowels. Provide expansion joints at maximum 40 feet (12 m) o.c.e.w. in parking lots, 40 feet (12 m) o.c. for curbs and maximum 20 feet (6 m) o.c.e.w. at pedestrian paving.
- C. When stoppage occurs at a contraction joint, install sheet metal joint assembly of sufficient section to prevent deflection, shaped to concrete section. Drill bulkhead to permit continuation of longitudinal reinforcing steel through construction joint.
- D. Stoppage at Unintentional Location:
  - 1. Immediately upon unintended stoppage of concrete placing, place available concrete to a line and install bulkhead perpendicular to surface of pavement and at required elevation. Place and finish concrete to this bulkhead. Remove and dispose of concrete remaining on subgrade ahead of bulkhead.
  - 2. When placing of concrete is resumed before concrete has set to extent that concrete will stand on removal of bulkhead, new concrete shall be rodded with the first; otherwise, carefully preserve joint face.
  - 3. Provide a joint seal space at edges created by a construction joint of this type shall have a joint seal space as detailed on Drawings.
- E. Provide sawed contraction joints in vehicular paving and curbs spaced as detailed on Drawings, but in no case greater than 20 feet (6 m) o.c. spacing.
  - 1. Saw joints after completion of finishing operations as soon as concrete has hardened to extent necessary to prevent revealing of joint or damage to adjacent concrete surfaces.
  - 2. Saw joints same day that concrete is placed except that sawing of joints in concrete placed late in day may be delayed until morning of following day.

- 3. In any event, saw joints within 18 hours after placing concrete.
- 4. Use a power-driven concrete saw made especially for sawing concrete and maintain in good operating condition.
- 5. Saw cut shall be to a depth equal to 1/4 of slab thickness, minimum one inch (25 mm) depth.
- 6. Align joints in vehicular paving with joints in adjacent pedestrian paving.
- 7. Cut joints through curbs at right angles to back of curb.
- F. Place joint filler between paving components and building or other appurtenances.
- G. Provide scored joints in sidewalks and plazas to a depth of 1/4 the slab thickness, and at intervals as indicated, but in no case spaced greater than width of walk.

### 3.7 PLACING CONCRETE

- A. Place concrete in accordance with ACI 301, 302, and 304. Deposit concrete so that specified slab thickness will be obtained after vibrating and finishing operations. Minimize handling to prevent segregation. Consolidate concrete by suitable means to prevent formation of voids or honeycombs. Exercise care to prevent disturbance of forms and reinforcing and damage to vapor retarder. Place concrete to lines and levels shown, properly sloped to drain as designed.
  - 1. Hot Weather Placement: ACI 305.
  - 2. Cold Weather Placement: ACI 306.
  - 3. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.
  - 4. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
- B. After consolidating and screeding, float concrete to gradients indicated. Use a straight edge to level and test surface in longitudinal direction to required grade. Finish edges to provide a smooth dense surface with 1/8 inch (3 mm) radius.

- C. Apply Bomanite Color Hardener prior to application of pattern. Apply at rate recommended by manufacturer, evenly to the surface of the fresh concrete by the dry-shake method. Applied in two or more shakes, floated after each shake and troweled only after the final floating.
- D. While concrete is still in its plastic state, apply the tool/texture pattern to the surface of the concrete. Properly tamp tools into the surface to achieve the required texture, with uniformity of pattern and depth of stamping. Utilize bond breaker to keep tools from sticking to fresh concrete.
  - 1. Release material shall be applied to the troweled surface prior to imprinting.
- E. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.
- F. Apply secondary stain treatment per approved mock-up or as scheduled to achieve design.
- G. Apply finish sealer per approved mock-up or as specified to achieve design required.

# 3.8 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01400.
- B. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

### 3.9 PROTECTION

A. Immediately after placement, protect concrete under provisions of Section 01500 from premature drying, excessive hot or cold temperatures, and mechanical injury.

END OF SECTION

# DIVISION 4 - MASONRY



### SECTION 04100

#### MORTAR

#### PART 1 - GENERAL

#### 1.1 DESCRIPTION

# A. Scope:

- 1. The General Contractor shall furnish all labor, materials, equipment and incidentals required to provide mortar as shown and specified.
- B. Related Work Specified Elsewhere:
  - 1. Section 03300, Cast-In-Place Concrete.
  - 2. Section 04412, Natural Stone Veneer.
  - 3. Section 07600, Flashing and Sheet Metal Trim.

# 1.2 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies: Wherever a fire resistance classification is shown or scheduled for unit masonry construction (4-hour, 3-hour and similar designations), provide mortar in proportions complying with the requirements established by UL and the New York State Uniform Fire Prevention and Building Code.
- B. Source Quality Control: Do not change source or brands of mortar materials during the course of the Work.
- C. Presubmittal Meeting: Before submitting samples for approval, the Contractor and their supplier shall meet on-site with the Engineer to review existing masonry to be matched and preview proposed products.
- D. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
  - 1. ASTM C 91, Masonry Cement.
  - 2. ASTM C 136, Standard Test Method for Sieve Analysis

of Fine and Coarse Aggregates.

- 3. ASTM C 144, Aggregate for Masonry Mortar.
- 4. ASTM C 150, Portland Cement.
- 5. ASTM C 207, Hydrated Lime for Masonry Purposes.
- 6. ASTM C 270, Mortar for Unit Masonry.
- 7. ASTM C 404, Aggregate for Masonry Grout.

#### 1.3 SUBMITTALS

- A. Samples: Submit for approval samples of each type of colored mortar, showing the range of color which can be expected in the work. Label samples to indicate type and amount of colorant used. Engineer's review will be for color only. Compliance with all other requirements in the exclusive responsibility of the Contractor.
- B. Manufacturer's Data: Submit for approval, copies of manufacturer's specifications and instructions for each manufactured product.

### 1. Product Data:

- a. Portland Cement: Brand and manufacturer's name.
- b. Masonry Cement: Brand and manufacturer's name.
- c. Lime: Brand and manufacturer's name.
- d. Sand(s): Location of pit, name of owner, and previous test data.
- e. Color Pigments: Brand and manufacturer's name.

# PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Portland Cement:
  - 1. ASTM C 150, Type I, nonstaining, without air

- entraining and of natural color or white, to produce the required color of mortar or grout.
- 2. Use ASTM C 150, Type III, high early strength, for laying masonry when outside temperature is less than 50°F.
- 3. Provide nonstaining portland cement, without air entraining and of natural color or of the color required to be compatible with the required colored mortar pigment selected by Engineer.
- 4. Product and Manufacturer: Provide one of the following:
  - a. Lehigh Portland Cement Type I and Type III, by Lehigh Hanson.
  - b. Or approved equal.
- 5. Product and Manufacturer: Provide one of the following:
  - a. White Portland Cement by Lafarge Holcim.
  - b. White Portland Cement Type I and Type III by Lehigh White Cement.
  - c. Or approved equal.
- B. Masonry Cement: Provide the following for masonry cement mortars:
  - 1. ASTM C 91, Type S; proportioned as specified to comply with ASTM C 270.
  - 2. Maximum Air Content, ASTM C 91: 18 percent.
  - 3. Nonstaining and of the color required to be compatible with the required colored mortar pigment selected by Engineer.
  - 4. Product and Manufacturer: Provide one of the following:
    - a. Flamingo-BRIXMENT Masonry Cement Type S by Lehigh Hanson.

- b. Or approved equal.
- C. Hydrated Lime: ASTM C 207, Type S, or lime putty ASTM C 5.
- D. Sand Aggregates:
  - 1. ASTM C 144, except for joints less than 1/4-inch use aggregate graded with 100 percent passing the No. 16 sieve.
  - 2. White Mortar Aggregates: Provide natural white sand or ground white stone for portland cement lime mortars.
- E. Grout Sand: ASTM C 404.
- F. Colored Mortar Pigments: Provide the following for Portland cement lime mortars:
  - 1. Commercial iron oxide, manganese dioxide, ultramarine blue, chromium oxide, or carbon black, compounded for use in mortar mixes.
  - 2. Do not exceed pigment to cement ratios, by weight of 1 to 35 for carbon black and 1 to 7 for other pigments.
  - 3. Product and Manufacturer: Provide one of the following:
    - a. TrueTone Mortar Colors by Davis Colors, Subsidiary of Rockwood Industries Incorporated.
    - b. MasterColor by Master Builders Solutions.
    - c. Or approved equal.
  - 4. Submit complete selection of manufacturer's standard and custom colors for final selection by Engineer.
- G. Water: Free from injurious amounts of oils, acids, alkalis, or organic matter, and clean, fresh and potable.

- H. Waterproofing Admixture (grout and mortar): Integral polymeric water repellent admixture complying with ASTM E 514 water resistance requirements.
  - 1. Proportion: In strict accordance with manufacturer's instructions.
  - 2. Exterior wall mortar admixture shall be compatible to the admixture used to produce the masonry units. Coordinate the selection with the masonry unit manufacturer.
  - 3. Comply with manufacturer's instructions for mixing and mortar preparation.
  - 4. When using bulk pre-blended mortar (silos, bulk bags, etc.) with dry admixture, the admixture in the pre-blended mortar must be from the same producer or compatible with that used in the CMU materials
- I. 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:

- a. Euclid Chemical Company (The); Accelguard 80.
- b. Grace Construction Products, a unit of W. R. Grace & Co. Conn.; Morset.
- c. Sonneborn, Div. of ChemRex; Trimix-NCA.

# 2.2 MORTAR MIXES

#### A. General:

- 1. Antifreeze Admixture or Agents: Not permitted.
- 2. Calcium chloride: Not permitted.
- B. Fire Resistant Mortar:
  - 1. Standard: UL Design Numbers U901, U902, U903, U904,

U905, U906, and U907.

- 2. Proportion: Use 1 part portland cement, 3 parts clean sand, and 15 percent hydrated lime (by cement volume).
- C. Mortar for All Unit Masonry: Comply with ASTM C 270 Table 2, except limit materials to those specified herein, do not substitute ASTM C 91 masonry cement for ASTM C 150 portland cement without an approved Shop Drawing review by Engineer, and limit cement to lime ration by volume as follows:

# 1. Type M:

- a. Portland Cement Lime Mortar; provide the following proportions by volume:
  - 1) Portland Cement: 1 part.
  - 2) Hydrated Lime or Lime Putty: 1/4 part.
  - 3) Aggregate Ratio (measured in damp loose condition): not less than 2-1/4 and not more than 3 times the sum of the volumes of cement and lime.
  - 4) Maximum Air Content, ASTM C 270: 12 percent.
- b. Portland Cement Masonry Mortar; provide the
  following proportions by volume:
  - 1) Portland Cement: 1 part.
  - 2) Masonry Cement: 1 part.
  - 3) Aggregate Ratio (measured in damp loose condition): Not less than 2-1/4 and not more than 3 times to sum of the volumes of cement and lime.
  - 4) Maximum air content, ASTM C 270: 18 percent.
- c. Property Specification:

- 1) Average Compressive Strength, ASTM C 270: 2,500 pounds per square inch.
- 2) Minimum Water Retention, ASTM C 270: 75 percent.

# 2. Type S:

- a. Portland Cement Lime Mortar; provide the following proportions by volume:
  - 1) Portland Cement: 1 part.
  - 2) Hydrated Lime or Lime Putty: Over 1/4 to 1/2 maximum.
  - 3) Aggregate Ration (measured in damp loose condition): Not less than 2-1/4 and not more than 3 times the sum of the volumes of cement and lime.
  - 4) Maximum air content, ASTM C 270: 12 percent.
- b. Portland Cement Masonry Mortar; provide the following proportions by volume:
  - 1) Portland Cement: 1/2 part.
  - 2) Masonry Cement: 1 part.
  - 3) Aggregate Ratio (measured in a damp loose condition): Not less than 2-1/4 and not more than 3 times the sum of the volumes of cement and lime.
  - 4) Maximum air content, ASTM C 270: 18 percent.
- c. Property Specification:
  - 1) Average Compressive Strength, ASTM C 270: 1,800 pounds per square inch.
  - 2) Minimum Water Retention, ASTM C 270: 75 percent.

D. Grout: Comply with ASTM C 476. If grout types are not indicated on Drawings, furnish type (fine or coarse) most suitable for the particular job conditions to completely fill cavities and embed reinforcement and other built-in items.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Measurement of Materials:
  - 1. Mortar Cement and Hydrated Lime: Batched by the bag.
  - 2. Sand: Batched by volume in suitably calibrated containers, provided proper allowance is made for bulking and consolidation and for weight per cubic foot, of contained moisture.
  - 3. Proportion of volumetric Mixtures: One 94 pound sack of portland cement or one 50 pound sack of hydrated lime constitute nominal one cubic foot.
  - 4. Shovel measurement: Not permitted.

# B. Mortar Mixing:

- 1. Type of Mixer: Machine mix in approved mixer in which the quantity of water is accurately and uniformly controlled.
- 2. While mixer is in operation add approximately 3/4 the required water, 1/2 the sand, all the cement, then add remainder of sand.
- 3. Allow batch to mix briefly then add water in small quantities until satisfactory workability is obtained.
- 4. Mix for not less than five minutes after all materials have been added.
- 5. Hydrated Lime for Mortar Requiring Lime Content: Use dry-mix method. Turn over together the materials for each batch until the even color of

the mixed, dry materials indicates that cementitious material has been thoroughly distributed throughout the mass, then add water to obtain required plasticity.

- 6. Lime putty if approved for use shall be prepared in accordance with ASTM C 5.
- 7. Waterproofing Admixture: Add to mortar mix and grout for all exterior masonry in strict accordance with manufacturer's instructions.
- 8. The mixer drum shall be completely emptied before recharging the next batch.
- 9. Limit batch size to avoid re-tempering. Retempering of mortar shall not be permitted.
- 10. Mixers, wheelbarrows, mortar boards, etc., shall be kept clean.

# 3.2 INSTALLATION

A. Refer to Section 04201, Unit Masonry Construction.

# 3.3 FIELD QUALITY CONTROL

- A. The Contractor shall have an independent laboratory take samples and conduct tests to evaluate air entrainment, water retention and the compliance of materials with the specifications and to determine the compressive strength of mortar and grout. Tests shall be conducted in accordance with ASTM C 91. Tests results shall be made available prior to the commencement of work.
- B. After the initial test, the Engineer will require a maximum of 5 additional tests to be conducted at their discretion.
- C. Installed mortar that does not meet the requirements of the specification shall be immediately removed and rebuilt.

+ + END OF SECTION + +



### SECTION 04730

### MANUFACTURED STONE VENEER

#### PART 1 - GENERAL

# 1.1 SUMMARY

A. Section Includes: Manufactured stone veneer products.

#### 1.2 RELATED SECTIONS

- A. Section 03300, Cast-In-Place Concrete
- B. Section 06100, Rough Carpentry
- C. Section 07600, Flashing and Sheet Metal Trim
- D. Section 07920, Caulking and Sealants

### 1.3 REFERENCES

- A. ASTM C 39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
- B. ASTM C 67 Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile
- C. ASTM C 177 Standard Test Method for Steady-State Head Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
- D. ASTM C 190 Method of Test for Tensile Strength of Hydraulic Cement Mortars
- E. ASTM C 192 Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
- F. ASTM C 482 Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement Paste
- G. ASTM C 567 Standard Test Method for Determining Density of Structural Lightweight Concrete
- H. ASTM C 1329 Standard Specification for Portland Cement
- I. ASTM C 1670 Standard Specification for Adhered Manufactured Stone Masonry Veneer Units.

- J. ASTM C 1780 Standard Practice for Installation Methods for Adhered Manufactured Stone Masonry Veneer
- K. ICC AC 38 Acceptance Criteria for Water Resistive Barriers
- L. ICC ESR 2598 Coronado Stone Products Evaluation Report
- M. LEED: US Green Building Council's Leadership in Energy and Environmental Design Green Building Rating System
- N. Texas Department of Insurance: Product Evaluation EC101
- O. UBC Standard No. 14-1, Kraft Waterproof Building Paper

# 1.4 SUBMITTALS

- A. Submit the following in accordance with Section 01300.
- B. Product Data: Manufacturer's specification and data sheets for each product used, including:
  - 1. Preparation instructions.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation guidelines.
  - 4. Cleaning and maintenance methods.
- C. Shop Drawings: Submit elevations and cross-section details showing proper installation methods.
- D. Sample Selection
  - Standard sample board with selected stone profile and color should be submitted for each product specification.
  - 2. Selection of approved grout colors and styles (if applicable).
- E. Sample Verification: A field panel sample with the minimum size of 3' x 3' should be installed for every product selection showing: styles, colors, textures and grout colors.

- F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- G. Closeout Submittals: Provide manufacturer's warranty and maintenance recommendations.

# 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Coronado Stone Products
- B. Installer Qualifications: Minimum 5 years experience with similar scope of work and must be able to furnish list of previous jobs and references if requested by Architect.
- C. Certifications: Products approved by ICC-ES Evaluation Service.
- D. Mock-Up: Provide field panel sample to evaluate preparation and application techniques.
- E. Pre-Installation Conference: Conduct a pre-installation meeting to verify all products, application methods, site conditions and warranty terms no less than thirty days prior to stone veneer installation.

# 1.6 DELIVERY, STORAGE & HANDLING

- A. Coordination of on-site delivery and storage should be arranged in advance to avoid work delays.
- B. Store and handle stone products in accordance with the manufacturer's recommendations.
- C. All material stored on-site should be protected from the elements before and during the installation process. Store material under cover and in a dry location.
- D. Store mortar, sealant and other installation material in compliance with the manufacturer's recommendations.

# 1.7 PROJECT CONDITIONS

- A. Maintain manufacturer's recommended environmental conditions to ensure optimum results.
- B. Cold Weather Requirements: Installations should be performed in temperatures exceeding 40 degrees Fahrenheit prior to, during and for 48 hours after

- completion of work. If temperatures are below 40 degrees Fahrenheit, masons should use heaters and tents during the installation process to regulate temperature.
- C. Hot Weather Requirements: If temperatures exceed 90 degrees Fahrenheit during the installation, additional moisture will need to be added to the backs of the stone veneer and scratch coated surface. Shade and/or frequent misting of the wall and stone may be required.

### 1.8 WARRANTY

A. Provide manufacturer's 50 year limited warranty.

# PART 2 - PRODUCTS

#### 2.1 MANUFACTURER

- A. Acceptable Manufacturer: Coronado Stone Products (Corporate Office), which is located at: 2806 Grandview Dr., Simpson, SC 29680; Tel: 864-297-7090; Email: sales@coronado.com; Web: www.Coronado.com
- B. Substitutions: Approved Equal.

### 2.2 MATERIALS

- A. Manufactured Stone Veneer:
  - 1. Profile / Color: Basis-of-Design: Proledge Huron.
  - 2. Approved Equal.
- B. Manufactured Stone Veneer Properties: Units consisting of Portland cement, lightweight aggregates and oxide pigments.
  - 1. Compressive Strength: Tested in accordance with ASTM C39 and ASTM C192, greater than 1800 psi.
  - 2. Shear Bond Test: Tested in accordance with ASTM C482, greater than 50 psi.
  - 3. Water Absorption: Tested in accordance with section 3.1.4 and 4.6 of ICC-ES AC51.
  - 4. Freeze / Thaw: Tested in accordance with ASTM C67, less than 3% mass loss.

5. Unit Weight: Shipping weight is less than 15 lbs. per sq ft, density is determined in accordance with ASTM C567.

#### PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Do not begin the installation process until substrates have been properly prepared.
- B. Notify architect of any unsatisfactory preparation of substrate before proceeding.
- C. Correct all unsatisfactory substrate conditions before installation begins.
- D. Verify roofs use proper water displacement methods to direct moisture away from the installed stone veneer.
- E. If substrate surface is questionable, bonding tests should be performed before installation to assess adhesion and confirm proper bonding strength.
- F. Flashing must be installed at wall penetrations and terminations of the stone veneer. Assure that all flashing and kickouts are corrosion resistant, integrated with the WRB properly (when used), and installed in accordance with the local building code requirements.

#### 3.2 PREPARATION

- A. Clean all surfaces thoroughly prior to installation.
- B. Use manufacturer surface preparation recommendations to achieve best result.

#### 3.3 INSTALLATION

- A. Product should be pulled from a variety of boxes and blended on site during installation to ensure a consistent overall project color on the wall.
- B. Install in accordance with manufacturer's installation instructions. Visit this page for detailed installation instructions https://www.coronado.com/InstallationGuide

- C. Application details and mortar recommendations may vary depending on the stone style. Consult manufacturer for proper installation instructions.
- D. All dry-stacked and large format standard stones should be installed using a polymer-modified mortar meeting ANSI A118.4 or ANSI 118.15.
- E. All Classic Series and WoodStone products must be applied with a polymer-modified thinset bonding mortar meeting ANSI Al18.4 or ANSI 118.15.
- F. All applications in freeze-thaw environments require a polymer-modified mortar.

# 3.4 CLEANING AND PROTECTION

- A. Installed manufactured stone veneer can be cleaned with a mild soap and water solution.
- B. Cleaning efflorescence can be done by lightly scrubbing the face of the stone with a soft bristle brush and water. In some cases, a 25% vinegar 75% water solution may need to be used. Do not use any harsh cleaning methods to remove efflorescence.
- C. Touch-up, repair or replace damaged stone before completion of project.
- D. Water repellents and enhancers can be used to further protect a finished project. Only breathable, penetrating water-based silane water repellents should be used.

# DIVISION 5 - METALS



# SECTION 05500

### METAL FABRICATIONS

# PART 1 - GENERAL

# 1.1 DESCRIPTION OF WORK

- A. Scope: Contractor shall furnish all labor, materials, equipment and incidentals required to provide miscellaneous metal fabrications including surface preparation and shop priming, as shown and specified.
- B. The extent of miscellaneous metal fabrications Work is shown on the Drawings and includes items fabricated from iron, steel, stainless steel and aluminum shapes, plates, bars, castings and extrusions, which are not a part of the structural steel or other metal systems covered by other Sections of these Specifications.
- C. Provide metal fabrications and miscellaneous metals as indicated on the Drawings and as specified herein, including, but not limited to the following:
  - 1. Embedded steel plates.
  - 2. Miscellaneous framing and supports
  - 3. Support Inserts
  - 4. Loose Bearing Plates
  - 5. Lintels (Exterior)
  - 6. I-Beam, channel, angle, and other miscellaneous iron work
  - 7. Miscellaneous bolts, anchors and inserts to be set in concrete
- D. Related Work Specified Elsewhere:
  - 1. Section 05503, Fasteners for Miscellaneous Metal Fabrications.

### 1.2 REFERENCES

- A. References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.
- B. American Society for Testing and Materials (ASTM)
- C. American Welding Society (AWS).
- D. American National Standards Institute (ANSI)
- E. Society for Protective Coatings (SSPC)
- F. Federal Specifications (FS)
- G. National Association of Architectural Metals Manufacturers (NAAMM)
- H. Aluminum Association (AA)
- I. The Building Code of New York State, latest edition.
- J. The American Galvanizers Association

# 1.3 SUBMITTALS

- A. Product Data, for each item specified.
  - Shop Drawings for the fabrication and erection of all assemblies of miscellaneous metal Work. Include plans, elevations, and details of sections and connections. Show anchorage and accessory items. Include setting drawings and templates for location and installation of miscellaneous metal items and anchorage devices.
  - 2. Submit product data sheets for products used in metal fabrications, including anchoring devices. Instructions for installation of anchorage devices built into other work.
  - 3. Submit product data sheets for painting materials.

- 4. Submit product data sheets for grouts and sealants.
- B. Shop Drawings, for each item specified.
  - 1. Show all locations, markings, quantities, materials, sizes and shapes.
  - Indicate all methods of connecting, anchoring, fastening, bracing and attaching to work of other trades.

#### C. Calculations

1. Where metal fabrications are required to comply with certain design loadings, submit structural design, structural calculations, materials properties, and other information needed for structural analysis, signed and sealed by the New York State licensed Professional Engineer responsible for their preparation.

# D. Samples

- 1. Where specified, submit samples of fabricated items, hardware, and finishes for selection.
- E. Welder certificates signed by the Contractor certifying that welders comply with requirements specified under Article titled "Quality Assurance".
- F. Qualification data for firms and persons specified in Article titled "Quality Assurance" to demonstrate their capabilities and experience.

### G. Warranty

1. Warranty as specified herein.

# 1.4 QUALITY ASSURANCE

A. Items provided in this Section shall be manufactured and fabricated by firms experienced in the type of Work specified.

- B. Installation shall be by installers experienced in the type of Work specified for the respective item. Installer shall be acceptable to the manufacturer.
- C. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code -Steel", D1.3 "Structural Welding Code - Sheet Steel", and D1.2 "Structural Welding Code - Aluminum".
  - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
  - All field welding shall be performed by a qualified welded with all required certifications, including local fire marshal, building department, and AWS requirements.
- D. Engineer Qualifications: Professional Engineer licensed to practice in jurisdiction where project is located and experienced in providing engineering services of the kind indicated that have resulted in the successful installation of metal fabrications similar in material, design, and extent to that indicated for this project.

# 1.5 PRODUCT HANDLING

- A. Before shipment to the job, all finishes shall be adequately protected for transporting and erecting periods.
- B. Replace damaged items, with the approval of the Project Architect, and at no additional cost to the Authority.

### 1.6 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress and work of other trades to avoid delay of work.

# 1.7 WARRANTY

A. Warranty for metal fabrication items with galvanizing by zinc metallizing or hot dip galvanizing, and finish coated with epoxy paint system or powder coat system: The coating applicator's/Contractor's warranty that items shall not show signs of rust, and finish shall be fully warranted against peeling, cracking, crazing, blistering, chalking and fading for a period of 5 years from date of installation of products. If rusting or failure of coating occurs, new items shall be provided or coating shall be refurbished in the shop. Warranty includes labor to remove and replace the items.

### PART 2 - PRODUCTS

### 2.1 MATERIALS

#### A. Metals

1. Metal Surfaces, General: For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcherleveled sheet.

### 2. Ferrous Metals

- a. Wide Flange Structural Steel: ASTM A 36992, except as specified or shown otherwise.
- b. M and S-Shapes, Channels and Angles: ASTM A 36 or ASTM A 572, Grade 50.
- c. Steel Plates to be Bent or Cold-Formed: ASTM A 283, Grade C.
- d. Steel Bars and Bar-Size Shapes: ASTM A 675, Grade 70; or ASTM A 36.
- e. Merchant Quality Steel Bars: ASTM A 575, grade as selected by fabricator.

- f. Cold-Finished Steel Bars: ASTM A 108, grade as selected by fabricator.
- g. Hot-Rolled Carbon Steel Sheet and Strip: ASTM A 569, pickled and oiled.
- h. Cold-Rolled Carbon Steel Sheet: ASTM A 366, oiled.
- i. Galvanized Steel Sheet: ASTM A 526, with G90 hot-dip process zinc coating complying with ASTM A653.
- k. Cold-Drawn Steel Tubing: ASTM A 512, buttwelded, cold-finished carbon steel tubing, sink drawn and stress relieved.
- 1. Cast Iron Castings: ASTM A 48, gray iron castings, Class 30.
- m. Malleable Iron Castings: ASTM A 47, grade as selected by fabricator.
- n. Exterior Lintels: ASTM A 36, Galvanized.
- o. Bearing Plates: ASTM A36. Provide bearing plates with headed studs as shown on drawings for masonry construction.
- p. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
- q. Steel Castings: ASTM A 27, grade and class as required by use of item.
- r. Steel Pipe: ASTM A 53, type as selected, Grade A; black finish unless galvanizing is required; standard weight (Schedule 40), unless otherwise shown or specified.

s. Rolled Steel Floor Plate, Raised Pattern: ASTM A 786; raised herringbone pattern unless otherwise indicated.

### Aluminum

- a. Alloy and Temper: Provide alloy and temper as shown or specified, or as otherwise recommended by the aluminum producer or finisher.
- b. Extruded Shapes and Tubes: ASTM B 221.
- c. Plate and Sheet: ASTM B 209.
- d. Bars, Rods and Wire: ASTM B 211.
- e. Castings: ASTM B 26, Alloy 713 Temper T5.
- 4. Zinc Coated Hardware: ASTM A 153.
- 5. Stainless Steel Type 304L, Type 316L.
  - a. Plate, sheet and strip; Type 302/304; ASTM A 666
  - b. Bars and shapes; ASTM A 276
  - c. Tubing ASTM A 269
  - d. Wide Flange Structural Steel: ASTM A 276, except as specified or shown otherwise.
  - e. M and S-Shapes, Channels and Angles: ASTM A276, ASTM A479 and ASME SA479.

# B. Grout and Anchoring Cement

- 1. Nonshrink Metallic Grout: Premixed, factory-packaged, ferrous aggregate grout complying with Federal Specification CE CRD-C 621 specifically recommended by manufacturer for heavy-duty loading applications of type specified in this section.
- 2. Nonshrink Nonmetalic Grout: Premixed, factorypackaged, nonstaining, noncorrosive, non-gaseous grout complying with Federal Specification CE CRD-

- C 621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.
- 3. Erosion-Resistant Anchoring Cement: Factoryprepackaged, 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 need for protection by
  a sealer or waterproof coating and is recommended
  for exterior use by manufacturer.
- 4. Products: Subject to compliance with requirements, provide one of the following:
  - a. Nonshrink Metallic Grouts:
    - 1) "Hi Mod Grout", Euclid Chemical Co.
    - 2) "Embeco 885 and 636", Master Builders
    - 3) "Ferrolith G Red-Mix and G-NC", Sonneborn Building Products Div., Rexnord Chemical
  - b. Nonshrink Nonmetallic Grouts:
    - 1) "Euco N-S Grout", Euclid Chemical Co.
    - 2) "Crystex", L & M Construction Chemicals,
      Inc.
    - 3) "Masterflow 713", Master Builders
    - 4) "Sonogrout", Sonneborn Building Products Div., Rexnord Chemical Products, Inc.
    - 5) "Five Star Grout", U.S. Grout Corp.
  - c. Erosion-Resistant Anchoring Cement:
    - 1) "Super Por-Rok", Miniwax Construction Products Division

### 2.2 FINISHES

### A. General

- 1. Comply with NAAM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
- 2. Finish metal fabrications after assembly.
- 3. Refer to Articles 2.04 and 2.05 for painting and galvanizing.

# B. Steel Finishes

- 1. Stainless: Stainless Steel shall be provided with a uniform, bright, mill-polished surface obtained by finishing with a 150 220 mesh abrasive, following initial grinding with coarser abrasives. The finish shall be characterized by very fine parallel "grit lines" and be within a uniform range established as either an AISI No. 4 or 5 finish, with final finish established by Sample submission as approved by Engineer in compliance with AISI/NIDI 9012 or AMP/NAAMM AMP 503.
- 2. Galvanizing: Unless otherwise noted on drawings or specific item specifications, all steel that is not Stainless shall be hot-dipped galvanized per ASTM A123 and A153 as applicable. For touch up galvanizing, provide organic, zinc-rich coat
- 3. Tnemec 90-97 or Approved Equal.

# C. Aluminum Finishes

- 1. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.
  - a. As Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).
  - b. Class 1 Clear Anodized Finish: AA-M12C22A41 (Mechanical Finish: as fabricated, nonspecular; Chemical Finish: etched, medium matte; Anodic Coating: Class I Architectural:

clear film thicker than 0.7 mil) complying with AAMA 607.1.

#### 2.3 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports indicated and as necessary to complete the Work.
- B. Fabricate units from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
- C. Galvanize miscellaneous framing and supports.

#### 2.4 MISCELLANEOUS STEEL TRIM

- A. Fabricate trim of shapes, sizes, and profiles shown, with continuously welded joints and smooth exposed edges, unless otherwise indicated or approved. Use concealed field splices wherever possible. Furnish necessary cutouts, fittings, and anchorages.
- B. Galvanize exterior steel trim.

### 2.5 LOOSE BEARING PLATES

A. Steel plates fabricated flat, free from warp or twist, and of required thickness and bearing area. Drill plates as required for anchor bolts and for grouting access. Furnish bearing plates where shown and where required for steel items bearing on masonry or concrete construction.

#### 2.6 LOOSE LINTELS

- A. Structural steel shape lintels, fabricated for openings and recesses in masonry walls and partitions as indicated. Loose lintels bearing on masonry or concrete shall have a minimum end bearing length of 6 inches at each end, unless otherwise shown.
- B. Galvanize lintels to be installed in exterior walls.

# 2.7 CAST NOSINGS, TREADS, AND THRESHOLDS

- A. Fabricate units of metal indicated below in sizes and configurations indicated and in lengths necessary to accurately fit openings or conditions. Provide units with an integral abrasive finish consisting of aluminum oxide, silicon carbide, or a combination of both.
  - 1. Metal: Cast gray iron, Class 20.
- B. Configurations: Provide units in the following configurations, unless otherwise indicated:
  - 1. Nosings: Cross-hatched units, 4 inches wide with 1-inch lip, for casting into concrete steps.
- C. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.
- D. Apply bituminous paint to concealed bottoms, sides, and edges of units set into concrete.
- E. Provide a plain surface texture, unless fluted or crosshatched surfaces are indicated.
- F. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. American Safety Tread Co., Inc.
  - 2. Amstep Products.
  - 3. Armstrong Products, Inc.
  - 4. Balco/Metalines, Inc.
  - 5. Granite State Casting Co.
  - 6. Safe-T-Metal Co.
  - 7. Wooster Products Inc.

### 2.8 MISCELLANEOUS ITEMS

### A. Vent Screens:

1. A vent screen shall be furnished and installed on each vent and overflow pipe. Unless otherwise shown on the Contract Drawings, the vent screen shall consist of a circular frame sized and drilled to match the pipe flange and 1/2 inch square mesh fastened to the frame. The frame and mesh shall be of Type 304 stainless steel. The mesh shall not be less than 14 gage. Fasteners shall be of Type 316 stainless steel.

# B. Miscellaneous Framing and Supports:

- 1. Provide miscellaneous metal framing and supports which are not a part of the structural steel framework and are required to complete the work.
- 2. Fabricate miscellaneous units to the sizes, shapes and profiles shown or, if not shown, of the required dimensions to receive adjacent grating, plates, doors, or other work to be retained by the framing. Except as otherwise shown, fabricate from structural shapes, plates, and bars, of all welded construction using metered corners, welded brackets and splice plates and a minimum number of joints for field connection. Cut, drill and tap units to receive hardware and similar items to be anchored to the Work.
- C. Fasteners and Fittings: Provide stainless steel, Type 316L, for all aluminum fabrications, and zinc coated hardware for all galvanized fabrications and items embedded in concrete, unless otherwise shown or specified.
- D. Expansion Shield Fasteners: Fasteners shall be as specified in Section 05503.
- E. Primer Paint: Unless otherwise shown or specified, prepare surfaces and prime steel items as required under Section 09900, Painting, of these Specifications.
- F. Field Paint: Field paint is included in Section 09900, Painting.

G. Galvanizing: All galvanizing of fabricated steel items to comply with the requirements of ASTM A 123.

### H. Ladders:

- Ladders shall be provided in locations as indicated on plans. Ladders, safety devices and safety cages shall be as required by state and federal regulations.
  - a. Ladders shall be provided down to the floor in each location.
  - b. Ladder side rails shall be a minimum 3/8 inch by 2 1/2 inch with a 16 inch clear spacing. Rungs shall be minimum 3/4 inch diameter, spaced at 12 inch centers and plug welded into holes drilled in the side rails.
  - c. Ladders shown against structures shall be secured to the adjacent structure by brackets located at intervals not exceeding 10 ft. Brackets shall be of sufficient length to provide a minimum distance of 7 inches from the center of rung to the nearest permanent object behind the ladder.
  - d. Portable Ladder extension
    - 1) Manufacturer:
      - a) The BILCO Company, P.O. Box 1203, New Haven, CT 06505; 1-203-934-6363, Fax: 1-203-933-8478 Internet address: http://www.bilco.com
      - b) Or approved equal
    - 2) Furnish and install where indicated on plans ladder safety post Model LU-2, The ladder safety post shall be pre-assembled from the manufacturer.
      - a) Performance characteristics:

- Tubular post shall lock automatically when fully extended.
- Safety post shall have controlled upward and downward movement.
- Release lever shall disengage the post to allow it to be returned to its lowered position.
- Post shall have adjustable mounting brackets to fit ladder rung spacing up to 14" on center and clamp brackets to accommodate ladder rungs up to 1-3/4" in diameter.
  - Post: Shall be manufactured of high strength square tubing. A pull up loop shall be provided at the upper end of the post to facilitate raising the post.
- Material of construction: Shall be steel (LU-2);
- Balancing spring: A stainless steel spring balancing mechanism shall be provided to provide smooth, easy, controlled operation when raising and lowering the safety post.
- 2. Hardware: All mounting hardware shall be Type 316 stainless steel.
- 3. Finishes: Factory finish shall be hot dip galvanized steel (Model LU-2).

### 2.9 FABRICATIONS

### A. General

- 1. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.
- 2. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- 3. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.
  - a. Temperature Change (Range): 180°F
- 4. Shear and punch metals cleanly and accurately. Remove burrs.
- 5. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bentmetal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- 6. Remove sharp or rough areas on exposed traffic surfaces.
- 7. Weld corners and seams continuously to comply with AWS recommendations and the following:
  - a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

- b. Obtain fusion without undercut or overlap.
- c. Remove welding flux immediately.
- d. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.
- 8. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flathead (countersunk) screws or bolts. Locate joints where least conspicuous.
- 9. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
- 10. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- 11. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.
- 12. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

### B. Support Inserts

1. Provide "Peerless Wedge" hot-dip galvanized inserts for anchorage to concrete at locations shown on the Drawings, or as required. Wedge inserts shall be provided with a 3/4" bolt, nut, and washers, all hot-dip galvanized. Install 3/4" diameter reinforcing bar X 1'-6" minimum length through anchor loop to increase anchorage in concrete. Space inserts 2'-6" on centers (maximum) starting

6" from face of masonry opening. Submit three (3) samples for approval. Shims shall be square horseshoe shape, hot-dip galvanized, as indicated on the Drawings.

### C. Lintels (Exterior)

- 1. Furnish to mason at the proper time for setting all steel lintels in exterior walls not connected (by hangers, clips, bolts, or otherwise) to the structural work. Lintels in exterior walls of reinforced concrete framed superstructure or portion thereof, or in the concrete fire proofing of steel spandrel beams shall be secured in place by means of wedge inserts in concrete beams or steel spandrel fireproofing.
- 2. All exterior lintels in exterior walls shall be galvanized. Bolts connecting lintels to the galvanized wedge inserts shall be galvanized in accordance with ASTM A153. Lintels exposed to view shall also be finish painted as specified herein with powder coating or epoxy coating system.
- D. Loose lintels bearing on masonry or concrete shall have a minimum end bearing length as shown on the drawings, minimum 6 inches at each end.

# PART 3 - EXECUTION

#### 3.1 INSPECTION

A. Make all required measurements in the field to ensure proper and adequate fit.

# 3.2 DISCREPANCIES

- A. Immediately notify the Authority's Representative.
- B. Do not proceed until fully corrected.

# 3.3 ERECTION/INSTALLATION

A. Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction; including, threaded fasteners for concrete

and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.

- Provide inserts, setting plates, and other items of concealed work required for attachment of metal fabrications in a timely manner to facilitate ongoing construction.
- B. Perform cutting, drilling, and fitting required for installation of metal fabrications. Set work accurately in location, alignment, and elevation, plumb, level, true, and free of rack, measured from established lines and levels. Do not weld, cut, or abrade surfaces of metal fabrications that have been coated or finished after fabrication and are intended for field connection by mechanical means without further cutting or fitting.
- C. Fit exposed connections accurately together to form tight, hairline or, where indicated, with uniform reveals and spaces for sealants and joint fillers.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.
- E. Install concealed gaskets, joint fillers, insulation and flashings as the work progresses, so as to make work weathertight, sound proof or lightproof as required.
- F. Restore protective coverings that have been damaged during shipment or installation of the work. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at the same location.
- G. Field Welding: All field welding shall be performed by a qualified welded with all required certifications, including local fire marshal, building department, and requirements. Comply AWS with applicable specification for procedures of manual shielded metalarc welding, for appearance and quality of welds made, and for methods used in correcting welding work. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed welded joints smooth and restore finish to match finish of adjacent surfaces.

- H. Corrosion Protection: Coat concealed surfaces of aluminum and steel which will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- I. Adjust metal fabrications prior to anchoring to ensure matching alignment at abutting joints.
- J. Install items as detailed in the drawings; for manufactured items, install as recommended by the Manufacturer, unless indicated otherwise.
- K. Coordinate with other trades involved.
- L. Install detectable warning surfacing in manner for top surface to align with adjacent finish flooring surface (or slab surface for finished exposed concrete).
- M. Field Touch-Up
  - 1. Painted Members: After erection, clean all damaged areas in shop coat, exposed surfaces of bolts, bolt heads, nuts and washers, abrasions, and all field welds and unpainted areas adjacent to field welds to the same standards as the shop coat and paint with primer paint to same thickness as the shop coat. Finish painting is specified in Section 09900.
  - 2. Galvanized Members: After erection, clean and paint all damaged areas to the galvanizing, welds, and areas adjacent to welds with the galvanizing repair paint complying to ASTM A780. For galvanized members to be painted, finish painting shall be the final two coats of the epoxy coating system. For powder coating system follow instructions of the powder coat manufacturer, to match surrounding undamaged areas.

# 3.4 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

# 3.5 INSTALLING NOSINGS, TREADS, AND THRESHOLDS

- A. Install with anchorage system indicated to comply with manufacturer's written instructions.
- B. Center nosings on tread widths.
- C. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces.
- D. Seal thresholds exposed to exterior with elastomeric sealant complying with Division 7 Section 07920, Caulking and Sealants to provide a watertight installation.

### 3.6 PROTECTION

- A. Protect finishes of metal work from damage during construction period by use of temporary protective coverings approved by ornamental metal manufacturer. Remove protective covering at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items which cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

+ + END OF SECTION + +

### SECTION 05503

### FASTENERS FOR MISCELLANEOUS METAL FABRICATIONS

# PART 1 - GENERAL

### 1.1 SUMMARY

- A. Scope:
  - Installing Contractor shall furnish all labor, materials, equipment, and incidentals required to provide anchor bolts, expansion anchors and concrete inserts as shown and specified.
- B. This section includes all bolts, anchors and inserts required for the Work but not specified under other Sections.
- C. The types of work using the bolts, anchors and inserts include, but are not limited to the following:
  - 1. Rails.
  - 2. Hangers and brackets.
  - 3. Equipment, frames and bases.
  - 4. Piping.
  - 5. Electrical.
  - 6. Grating.
  - 7. Ladders.
- D. Related Work Specified Elsewhere:
  - 1. Section 05500, Metal Fabrications.
  - 2. Section 05521, Aluminum Handrails and Railing

### 1.2 QUALITY ASSURANCE

A. Reference Standards: Comply with the applicable provisions and recommendations of the following, except as otherwise shown and specified.

- 1. ASTM A 307, Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength.
- 2. ASTM A 320, Alloy-Steel and Stainless Steel Bolting for Low-Temperature Service.
- B. Expansion anchors and inserts shall be UL or FM approved.

### 1.3 SUBMITTALS

- A. Samples: Submit for approval representative samples of bolts, anchors and inserts as may be requested by the Engineer. Their review will be for type and finish only. Compliance with all other requirements is exclusive responsibility of Contractor.
- B. Shop Drawings: Submit for approval the following:
  - 1. Setting drawings and templates for location and installation of anchorage devices.
  - 2. Copies of manufacturer's specifications, load tables, dimension diagrams and installation instructions for the devices.

### PART 2 - PRODUCTS

#### 2.1 DESIGN CRITERIA

- A. When the size, length or load carrying capacity of an anchor bolt, expansion anchor, or concrete insert is not shown on the Drawings, provide the size, length and capacity required to carry the design load times a minimum safety factor of four.
- B. Determine design loads as follows:
  - 1. For equipment anchors, use the design load recommended by the manufacturer and approved by the Engineer.
  - 2. For pipe hangers and supports, use one half the total weight of pipe, fittings, valves, accessories and water contained in pipe, between the hanger or support in question and adjacent hangers and supports on both sides.

- 3. Allowances for vibration are included in the safety factor specified above.
- 4. Anchors shall develop ultimate shear and pull-out loads of not less than the following values in concrete:

Bolt Diameter	Minimum Shear	Minimum Pull-Out
(Inches)	(Pounds)	Load (Pounds)
1/2	4,500	6 <b>,</b> 300
5/8	6 <b>,</b> 900	7,700
3/4	10,500	9,900

### 2.2 GENERAL

- A. General: Provide galvanized or type 304/316 SS fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon head type, ASTM A307, Grade A
- C. Stainless Steel Fasteners: ASTM A 666; Type 302/304 for interior Work; Type 316 for exterior Work; Phillips flathead (countersunk) screws and bolts for exposed Work unless otherwise specified. Lag Bolts: Square head type, ANSI B18.2.1
- D. Machine Screws: Cadmium plated steel, FS FF-S-92C
- E. Drilled-In Expansion Anchors: Anchors installed in concrete shall have current ICC-ES listing for performance in cracked concrete as per Section BC 1912.
- F. Eyebolts: ASTM A 489.
- G. Machine Bolts: ASME B18.5 or ASME B18.9, Type, Class, and Form as required.
- H. Machine Screws: ASME B18.6.3.
- I. Lag Screws: ASME B18.2.1.

- J. Wood Screws: Flat head, ASME B18.6.1.
- K. Plain Washers: Round, ASME B18.22.1.
- L. Toggle Bolts: Tumble-wing type, type, class, and style as required.
- M. Lock Washers: Helical spring type carbon steel, FS FF- W-84A
- N. Vandal resistant fasteners: Torx with pin, or as otherwise indicated. Corrosion resistant.

#### 2.3 MATERIALS

- A. Anchor Bolts:
  - 1. Provide stainless steel anchor bolts complying with ASTM A320.
- B. Expansion Anchors:
  - Provide stainless steel anchors. Anchors shall be of the size required for the concrete strength specified. Provide stud type (male thread) or flush type (female thread), as required.
  - 2. Product and Manufacturer: Provide anchors by one of the following:
    - a. Molly Division of USM Corporation.
    - b. Hilti, Incorporated.
      - c. Or approved equal.

### C. Adhesive Anchors:

- 1. Provide stainless steel HVA adhesive anchors as shown on Contract Drawings.
- 2. Product and Manufacturer:
  - a. Hilti, Incorporated
  - b. Or approved equal.

### D. Concrete Inserts:

- 1. Provide stainless steel inserts. Provide those recommended by the manufacturer for the required loading.
- 2. Manufacturer: Provide one of the following inserts:
  - a. Hohmann and Barnard Company.
  - b. Or approved equal.
- E. Powder actuated fasteners and other types of bolts and fasteners not specified herein shall not be used unless approved by Engineer.
- F. Connection Bolts, Nuts and Washers: Materials shall be as specified in other Sections of the Specifications, or shown on the Drawings. Where materials are not specified or shown on the Drawings, they shall be of Type 304 stainless steel.

### G. Toggle Bolts:

- 1. Provide stainless steel spring wing toggle bolts of the size required for secure anchorage of individual items, but not less than 1/4" diameter, of length required.
- 2. Product and Manufacturer: Provide one of the following:
  - a. Spring Wing Toggle Bolts by Ramset Fastening Systems.
  - b. No. 3000 Series, Snapin Toggle Bolts by Star.
  - c. Or approved equal.

# PART 3 - EXECUTION

# 3.1 INSTALLATION

A. Drilling equipment used and installation of expansion anchors shall be in accordance with manufacturer's instructions.

- B. Assure that embedded items are protected from damage and are not filled in with concrete.
- C. Expansion anchors may be used for hanging or supporting pipe 2 inches diameter and smaller. Expansion anchors shall not be used for larger pipe unless otherwise shown or approved by the Engineer.
- D. Use concrete inserts for pipe hangers and supports for the pipe size and loading recommended by the insert manufacturer.
- E. Unless recommended in bolt manufacture's literature or approved by the Engineer, conform to following for expansion anchors:
  - 1. Minimum embedment depth in concrete: 5 diameters.
  - 2. Minimum anchor spacing on centers: 10 diameters.
  - 3. Minimum distance to edge of concrete: 5 diameters.
  - 4. Increase dimensions above if required to develop the required anchor load capacity.
- F. Chromate Coating: All galvanized elements that will be embedded in or will come in contact with concrete mortar will require a chromate coating. This coating should be accomplished by either dipping the galvanized elements in a solution of sodium or potassium dichromate acidified with sulfuric acid or spraying this solution on the galvanized surfaces.
- G. Touch Up Painting: Touch-up galvanized surfaces with galvanizing repair paint applied in accordance with the manufacturer's instructions.

#### 3.2 CLEANING

A. After embedding concrete is placed, remove protection and clean bolts and inserts.

+ + END OF SECTION + +

### SECTION 05521

### ALUMINUM HANDRAILS AND RAILINGS

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

### A. Scope:

- 1. Contractor shall furnish all labor, materials, equipment and incidentals to provide aluminum guard rails, handrails and railing systems as shown and specified. The Work also includes:
  - a. Providing openings in and attachments to railings to accommodate the Work under this and other Sections and providing for the railings all items such as anchor bolts, fasteners, studs and all items required for which provision is not specifically included under other Sections.
  - b. Provide openings in and attachments to railings to accommodate the work under other contracts and assisting other contractors in building inserts and all other items required to be embedded in railings under other contracts.
  - c. The type of railing required is a welded system as shown on the Contract drawings.

#### B. Coordination:

- 1. Review installation procedures under other Sections and coordinate the Work that must be installed with or attached to the railings.
- C. Related Work Specified Elsewhere:
  - 1. Section 03300, Cast-In-Place Concrete.
  - 2. Section 05503, Fasteners for Miscellaneous Metal Fabrications.

3. Section 05500, Metal Fabrications.

### 1.2 QUALITY ASSURANCE

- A. Codes: Comply with applicable requirements of the New York State Uniform Fire Prevention and Building Code.
- B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
  - 1. ASTM B 241, Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
  - 2. AWS D10.7, Gas Shielded-Arc Welding of Aluminum and Aluminum Alloy Pipe.
  - 3. The Aluminum Association, Aluminum Standards and Data; and Standards for Anodized Architectural Aluminum.
  - 4. ANSI A12.1, Safety Requirements for Floor and Wall Openings, Railings, and Toe boards.
  - 5. OSHA Part 1910.23 Guarding Floor and Wall Openings and Holes.

#### 1.3 SUBMITTALS

A. Shop Drawings: Submit for approval Shop Drawings for the fabrication and erection of aluminum handrails and railings. Include plans, elevations, and details of sections and connections. Show anchorage items.

# 1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Pack and ship all railing to protect finish.

# PART 2 - PRODUCTS

# 2.1 PERFORMANCE CRITERIA

A. Contractor shall provide a guard rail, handrail and railing system that conforms to OSHA, Part 1910.23, 200-pound loading requirement. In addition, the system

shall conform to the following requirements of ANSI A12.1:

- 1. Completed railing to withstand:
  - a. Concentrated Load: 200 lb applied in any direction at any point on the rail.
  - b. Uniform Load: 50 lb/lf applied in any direction on the rail.
  - c. All above loads are not additive.
  - d. There shall be no permanent deflection after testing.

# 2.2 MATERIALS

- A. Extruded Aluminum Pipe and Tube: B 241, Alloy 6061-TG. Schedule 40 for rails and Schedule 80 for posts.
- B. Two Rail System:
  - 1. Use a welded pipe railing system with top and intermediate rail of 1-1/2 inch I.D. Schedule 40 aluminum and posts of 1-1/2" I.D. Schedule 80, Alloy 6061-TG with ground joints, unless otherwise indicated on the drawings.
  - C. Finish: Powder coated finish, color as selected by Owner from manufacturer's standard color selection chart.

### 2.3 FABRICATION

- A. Top rail shall be continuous over posts, and posts continuous from base to top rail. Intersections of rails and posts shall be made by coping the pipe and continuously welding. All welds shall be ground smooth. Railing splices shall be butted and reinforced by a tight-fitting interior sleeve not less than 6-inches long.
- B. Railings and posts shall be clear anodized after fabrication.

# PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Fastening to In-Place Construction:
  - 1. Provide anchorage devices and fasteners where necessary for securing handrails and railing items to in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts and other connectors as required.
  - 2. Use devices and fasteners that are compatible with aluminum.
- B. Cutting, Fitting and Placement:
  - 1. Perform cutting, drilling, and fitting required for installation. Set the Work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.
  - 2. Space posts 5 foot-6 inches on centers maximum and as shown.
  - 3. Secure handrails to walls with wall brackets and end fittings as shown. Drill wall plate portion of the bracket to receive one bolt. Locate brackets as shown or, if not shown, at not more than 8 feet on centers. Provide flush-type wall return fittings with the same projection as that shown for wall brackets. Secure wall brackets and wall return fit tings to building construction as follows:
    - a. For concrete anchorage use bolt anchor expansion shields and lag bolts.
- C. Protection from Dissimilar Materials:
  - 1. Using bitumastic material, coat all surfaces of aluminum in contact with dissimilar materials such as concrete, masonry and steel. Coat posts one inch above slab, deck or walk.

### 3.2 CLEANING AND REPAIRING

A. Cleaning:

- 1. Remove all stains, dirt, grease, or other substances by washing railings thoroughly using clean water and soap, rinse with clean water.
- 2. Do not use acid solution, steel wool or other harsh abrasive.
  - a. If stain remains after washing, remove finish and restore.

# B. Repair:

1. Remove stained or otherwise defective Work and replace with material that meets specification

+ + END OF SECTION + +



# DIVISION 6 - WOOD AND PLASTIC



### SECTION 06100

### ROUGH CARPENTRY

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

### A. Scope:

- 1. The General Contractor shall furnish all labor, material, equipment and incidentals required to provide rough carpentry as shown and specified.
  - a. Provide openings in rough carpentry to accommodate Work under this and other Sections and building into the carpentry all items such an sleeves, anchor bolts, inserts and other items to be embedded in carpentry for which placement is not specifically provided under other Sections.
  - b. Provide pressure-treated wood roof rafters and all other wood components.
  - c. Provide openings in rough carpentry to accommodate the Work under other contracts and assist other contractors in building into the rough carpentry all items such as sleeves, anchor bolts, inserts and all other items required to be embedded in rough carpentry under other contracts.
- 2. The extent of the carpentry work is shown on the Drawings.
- 3. The types of carpentry work required includes the following:
  - a. Pressure-treated wood components.
  - b. Plywood sheathing.
  - c. Lumber for temporary protection.
  - d. Lumber for temporary support of masonry and structural steel.

e. Lumber for protection of finished work.

### B. Coordination:

- 1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with the carpentry.
- C. Related Work specified Elsewhere:
  - 1. Section 06730, Composite Decking and Railings.
  - 2. Section 07210, Insulation.
  - 3. Section 07600, Flashing and Sheet Metal Trim.
  - 4. Section 07712, Gutters and Downspouts.

# 1.2 QUALITY ASSURANCE

- A. Lumber Standard Design Criteria: Comply with American Lumber Standard Committee PS-20, except as otherwise specified.
- B. Source Quality Control:
  - Factory-mark each piece of lumber and type, grade, mill and grading agency, except omit marking from surfaces to be exposed with transparent finish or without finish.
    - a. Pressure Preservative Treated Material:
      Accredited agency quality mark, on each piece
      of wood, indicating treatment.
    - b. Fire-Retardant Treated Material: Accredited testing agency mark, on each piece of wood, indicating compliance with the fire hazard classification.
  - 2. Shop-fabricate carpentry work to the extent feasible and where shop fabrication will result in better workmanship than feasible for on-site fabrication.
- C. Reference Standards: Comply with applicable provisions and recommendations of the following, except where otherwise shown or specified:

- 1. American Lumber Standard Committee, National Grading Rule for Dimension Lumber, PS-20.
- 2. American Lumber Standard Committee, Plywood Standard, PS-1.
- American Wood Preservers' Bureau Standard (AWPB), LP-2.
- 4. Occupational Safety and Health Administration (OSHA).
- 5. Southern Pine Inspection Bureau (SPIB), Grading Rules.
- 6. Western Wood Products Association (WWPA), Grading Rules.
- 7. AWPA-CA-Preservative Standards, Lumber and Plywood.
- 8. AWPA-C20-Fire Retardant Lumber Standards.
- 9. AWPC-C27-Fire Retardant Plywood Standards.
- 10. AWPA-M4-Standards for Care of Preservative-Treated Wood Products.
- 11. APA-Guide to Plywood Grades.
- 12. AFPA Manual of Wood Framing Construction.

#### 1.3 SUBMITTALS

#### A. Manufacturer's Data:

- 1. Submit for approval copies of chemical treatment manufacturer's instructions for proper use of each type of treated material.
- 2. For water-borne preservatives, include statement that moisture content of treated materials was reduced to maximum of 15 percent prior to shipment to Project site.

- B. Shop Drawings: Shop drawings shall include, but not be limited to:
  - 1. Complete layout and installation drawings and schedules with clearly indicated dimensions.
  - 2. Detail drawings of all construction details.
- C. Pressure Treatment Certificates: Provide certification by treating plant stating chemicals and process used, net amount of salts retained and conformance with applicable standards.

### 1.4 PRODUCT DELIVERY STORAGE AND HANDLING

- A. Storage of Materials: Keep materials dry during delivery and storage. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber and provide air circulation within stacks.
- B. Handling Materials: Handle all treated products as specified in American Wood Preservers' Association, M4.

### PART 2 - PRODUCTS

### 2.1 LUMBER

#### A. General:

- 1. Nominal sizes are shown, except as shown by detail dimensions. Provide actual sizes as required by American Lumber Standard Committee, National Grading Rule for Dimension Lumber PS-20, for the moisture content specified for each use.
  - a. Provide dressed lumber, S4S, unless otherwise shown or specified.
  - b. Provide seasoned lumber with 15 percent maximum moisture content at time of dressing.
- 2. Provide the following grade and species:
  - a. No. 2 Dimension Grade Douglas Fir Larch (North), WWPA.
  - b. No. 1 Dimension Grade Southern Pine, SPIB.

- C. Framing Lumber: Species: Douglas Fir or Hem-Fir (WWPA or WCLIB), or Southern Pine (SPIB), or Spruce-Pine-Fir (NGLA) unless otherwise indicated.
  - 1. Light Framing; 2 inches through 4 inches thick, less than 6 inches wide: Standard and Better grade, except Stud grade for stud framing.
  - 2. Structural Framing; 2 inches through 4 inches thick, 6 inches wide and wider: No. 2 grade.
- D. Board Lumber; less than 2 inches thick:
  - 1. Exposed Board Lumber, for Paint Finish: Southern Pine No. 1 (SPIB), Douglas Fir 2 Common (WWPA), Select Merchantable (WCLIB), or Spruce-Pine-Fir Appearance (NGLA).
  - 2. Concealed Board Lumber: Southern Pine No. 3 (SPIB), any species No. 4 (WWPA), any species Standard (WCLIB), or Spruce-Pine-Fir No. 1 / No. 2 (NGLA).
- E. Lumber for Protection and Temporary Support: Size and grades to meet applicable requirements of OSHA and structural requirements.
- F. Miscellaneous Lumber: Standard grade, No. 3 grade, or better grade of the following species unless otherwise indicated:
  - 1. Nailers and Blocking: Douglas Fir, Hem-Fir, Idaho White Pine, Southern Pine, or Spruce-Pine-Fir.
  - 2. Furring: Spruce, Hem-Fir, or Spruce-Pine-Fir except Douglas Fir or Southern Pine for furring required to receive preservative treatment.

# 2.2 PLYWOOD

A. Sheating and Subflooring: Exterior Type CC, Construction Grade, Group 1. (American Lumber Standard Committee, Plywood Standard, PS-1), APA rated for span with exterior glue CDX or better.

THICKNESS	SPAN RATING
3/8 inch	24/0
1/2 inch	32/16

THICKNESS	SPAN RATING
5/8	40/20
3/4	48/24

B. Interior Type BB-INT-DFPA Grade (American Plywood Association Trademark).

#### 2.3 WOOD TREATMENT

- A. Preservative Treatment: Where lumber is specified herein to be treated, comply with the applicable requirements of the American Wood Preservers Bureau (AWPB). Mark each treated item to comply with the AWPB Quality Mark requirements for the specified requirements.
  - 1. Pressure-treat aboveground items with Alkaline Copper Quat (ACQ) or Copper Azole (CA-B) preservatives complying with AWPA (US-040). After treatment, kiln-dry to a maximum moisture content of 19 percent. Treat indicated items and the following:
    - a. Wood rafters bridging, cants, nailers, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers and waterproofing.
    - b. Wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with masonry, plaster, or concrete.
    - c. Plywood used as substrate for single ply adhered roofing system and all other exterior locations.
    - d. Where items are cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment. Inspect each piece of lumber after drying and discard damaged or defective pieces.
  - Pressure Treatment (Ground Contact Use): Treat the following wood items with waterbourne preservatives for below ground use and exterior exposure, complying with AWPB LP-22:
    - a. Wood members placed in or on the ground.
    - b. Wood members immersed in fresh water.

- c. Wood members encased in concrete.
- 3. Where items are cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment. Inspect each piece of lumber after drying and discard damaged or defective pieces.

#### 2.4 FIRE-RETARDANT TREATMENT

- A. Furnish "FR-S" lumber where indicated, complying with AWPA Standards for pressure impregnation with fire-retardant chemicals to achieve a flamespread rating of 25 or less, when tested in accordance with UL Test 723, ASTM E 84 or NFPA Test 255.
  - 1. Where treated items are indicated to receive a transparent or paint finish, use a fire-retardant treatment which will not bleed through or adversely affect bond of finish.
  - 2. Provide UL label or identifying mark on each piece of fire-retardant lumber.
  - 3. Redry treated items to a maximum moisture content of 19 percent after treatment.
  - 4. Where items are cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment. Inspect each piece of lumber after drying and discard damaged or defective pieces.

# 2.5 ACCESSORIES

- A. Nails, Spikes, and Staples: Galvanized for exterior locations, high humidity locations, and treated wood; plain finish for other interior locations; size and type to suit application.
  - 1. Nails and Staples: FS FF-N-105.
- B. Bolts, Nuts, Washers, Lags, and Screws: Medium carbon steel; size and type to suit application; galvanized for exterior locations, high humidity locations, and treated wood; plain finish for other interior locations. Lab bolts and screws shall conform to ANSI/ASME B18.2.1.
  - 1. Wood Screws: FS FF-S-111.

- 2. Bolts and Studs: FS FF-B-575.
- 3. Nuts: FS FF-N-836.
- 4. Washers: FS FF-W-92.
- 5. Lag Bolts or Lag Screws: FS FF-B-561.
- C. Fasteners: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Explosive actuated type anchors shall not be used.
  - 1. Masonry Anchoring Devices: Expansion shields, masonry nails and drive screws: FS FF-S-325.
  - 2. Toggle Bolts: FS FF-B-588.
  - 3. Bar or Strap Anchors: ASTM A575 carbon steel bars.
  - 4. Wall Plugs: Corrugated type, galvanized steel, 24 USS gage min, not less than 2 inches wide x 2-1/2 inches deep.
  - 5. Metal Hangers and Framing Anchors: Size and type for intended use, galvanized finish, manufacturer's recommended fasteners.

### PART 3 - EXECUTION

### 3.1 INSPECTION

A. Contractor shall examine the substrate and conditions under which the carpentry work is to be performed, and notify the Engineer in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Engineer.

### 3.2 INSTALLATION

#### A. General:

1. Discard units of material with defects which might impair the quality of the work, and units which are too small to fabricate the work with minimum joints or the optimum joint arrangement.

- 2. Set carpentry work accurately to required levels and lines, with members plumb and true and accurately cut and fitted.
- 3. Securely attach carpentry work to substrates by anchoring and fastening as shown and as required by recognized standards. Countersink nail heads on exposed carpentry work and fill holes. Use common wire nails, except as otherwise shown. Make tight connections between members. Install fasteners without splitting of wood, predrill as required.

# B. Wood Grounds, Nailers, Blocking and Sleepers:

- 1. Provide wherever shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to provide for solid attachment of finish work. Coordinate location with other work involved.
- 2. Attach substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise shown. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.
- 3. Provide permanent grounds of dressed, preservative-treated, key-beveled lumber not less than 1 1/2-inch wide and of the thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.
- C. Wood Furring: Install plumb and level with closure strips at all edges and openings. Shim with wood as required for tolerance of finished work.
- D. Plywood Sheathing: Install over nailers and framing as shown.

# 3.3 TEMPORARY CONSTRUCTION

A. Provide all lumber and accessories required for scaffolding, safety and protection of the work.

- B. Provide and install all temporary protection in accordance with applicable provisions of the Contract Documents, OSHA regulations, and as follows:
  - 1. Temporary protection shall also include wood doors, railings, protection on floor or roof openings, temporary partitions, and the like; adequately maintained in good repair during the life of the Contract.
  - 2. Furnish and set temporary partitions with wood doors at all exterior doorways, exterior openings in exterior walls or in locations exposed to weather. These doors shall be substantially built and hung, equipped with proper hinges, locks and other necessary hardware, and shall be removed and reset whenever required to accommodate the work of other Contracts and shall be kept in good repair at all times.
  - 3. Provide substantial temporary wood covering over all openings left in roof for ducts, shafts, etc., using rough planking at least 2 inches thick, cleated together and otherwise made sufficiently strong and put in place wherever required.

+ + END OF SECTION + +

## SECTION 06661

## MANUFACTURED STANDING AND RUNNING TRIM

#### PART 1 - GENERAL

## 1.1 RELATED SECTIONS

- A. All contract documents apply to work of this section. This includes but is not limited to: Agreement; Drawings; Instructions to Bidders; General and Supplementary Conditions; and Division One Administrative Sections of the specifications.
- B. Related Sections:
  - 1. Section 06100, Rough Carpentry
  - 2. Section 07920, Caulking and Sealants
  - 3. Section 09900, Painting

#### 1.2 SUMMARY

- A. Section includes the furnishing and installation of specified PVC Foam trim and fabricated ornamental products, including but not limited to:
  - 1. Fabricated Ornamental Trim

## 1.3 REFERENCED STANDARDS

- A. Comply with applicable provisions and recommendations of the following except where otherwise shown or specified:
  - 1. ASTM D256- Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
  - 2. ASTM D570- Standard Test Method for Water Absorption of Plastics.
  - 3. ASTM D635- Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
  - 4. ASTM D638- Standard Test Method for Tensile Properties of Plastics.

- 5. ASTM D648- Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.
- 6. ASTM D696- Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 degrees C and 30 degrees C with a Vitreous Silica Dilatometer.
- 7. ASTM D790- Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- 8. ASTM D792- Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
- 9. ASTM D1761- Standard Test Methods for Mechanical Fasteners in Wood.
- 10. ASTM D2863- Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index).
- 11. ASTM D5420- Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact).
- 12. ASTM E84- Standard Test Method for Surface Burning Characteristics of Building Materials.

## 1.4 DESIGN/PERFORMANCE REQUIREMENTS

- A. Tolerances Finished surfaces for PVC flatness and cupping shall not vary more than >1/4 inch in 10 feet (3 mm in 3.05 m) and squareness 1/8 inch corner to corner when tested with a straight edge and shall be free from cracks, pits, chips, voids, depressions, bumps, ridges, waves, scratches, discoloration, and of other defacements.
- B. Products in this section shall comply with all requirements stipulated in the 2015 IBC and 2015 IRC.
- C. PVC Foam Trim and Fabricated Ornamental Products shall be designed, engineered, fabricated and installed to

conform to all state and local codes and the project drawings and specifications.

## 1.5 SUBMITTALS

- A. Product Data: Provide manufacturer's data sheets on each product to be used including: storage and handling requirements and recommendations; preparation instructions and recommendations and installation methods.
- B. Shop Drawings: Submit detailed drawings showing locations, profiles and product components, including but not limited to anchorage requirements, accessories and provisions for achieving desired finishes. Submit one set of CAD files for approval.
- C. Product Samples: For each finish profile and product specified, provide two samples representing the actual profile, product, pattern and finish specified. One set of approved samples will be returned to the contractor.
- D. Manufacturer's Certificates: Provide manufacturer's documentation to certify products submitted meet or exceed specified requirements.
- E. Test Reports: Submit manufacturer's test reports for PVC Foam Trim and Fabricated Ornamental Products from an accredited independent testing agency.

## 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall have not less than 5 years successful experience in producing the type of prefabricated components required for project applications equivalent to the requirements for this project.
- B. Installer Qualifications: Installer shall have a minimum of 5 years' experience installing the type of prefabricated components specified and shall be approved by the manufacturer.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
  - 1. Finish areas designated by Engineer.

- 2. Include mock-up for each profile combination indicated on the drawings.
- 3. Do not proceed with remaining work until workmanship, color and sheen are approved by Owner.
- 4. Rework mock-up areas as required to produce acceptable work.
- 5. Mock-up may remain as finished work if approved by Engineer and Owner.
- D. Pre-installation meetings: Conduct a pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements.

# 1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver all materials in original packaging, unopened with no visible damage.
- B. Label each package with product contents and stock number of contents, with warranty, installation, handling and storage recommendations enclosed, on-line or on packaging.
- C. Allow for receiving, unloading, handling, and movement to approved storage areas within the project, and final movement to point of installation.
- D. Store and protect all materials in accordance with manufacturer's requirements for environmental and physical protection. Keep temporary protective covering in place.
- E. Store products on flat level surface to prevent warping.
- F. Protect materials and finish from damage during handling and installation.

# 1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity and ventilation) within limits recommended by manufacturer for optimum results. Do not install

- products under environmental conditions outside manufacturer's recommendations.
- B. Field Measurements: Verify actual measurements and openings by field measurements before fabrication. Show recorded measurements on shop drawings.
- C. Allow at least 24 hours for materials to adapt to conditions at project site prior to installation.
- D. Protect uncoated portions of materials from ultraviolet exposure.

#### 1.9 WARRANTY

A. Upon completion of work, provide a written Manufacturer's Limited Warranty for products installed as part of this project to the Original Owner.

# PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Acceptable Manufacturer:
  - 1. Fypon, LLC 1750 Indian Wood Circle Maumee, OH 43537; Tel: 800-446-3040 http://www.fypon.com
    - Supplier: Accent Building Products, Arendtsville, Pa. 17303
  - VERSATEX Building Products, LLC 400 Steel Street
    Aliquippa, PA 15001 Tel: 724-857-1111
    http://www.versatex.com
  - 3. Or as required to match existing.

## 2.2 MATERIALS

A. Manufactured PVC foam trim and sheets are free foam PVC that is homogenous and free of voids, cracks and foreign inclusions and other defects. Edges must be square and top and bottom surfaces shall be flat with no convex or concave deviations.

- B. Manufactured PVC foam trim and sheets:
  - 1. Ornamental Fabrication: Crown Molding MLD 582-12
- C. Material shall have the following properties:

			ASTM TEST
PROPERTY	VALUE	Units	METHOD
Physical: Density: Water Absorption:	560 < 0.62	kg/m³	D 792 D 570
Mechanical: Tensile Strength: Tensile Modulus: Flexural Strength: Flexural Modulus: Nail Hold: Screw Hold: Staple Hold Gardner Impact:	2,740 163,000 4,120 154,000 69.6 587 180	psi psi psi psi lbf/in of penetration	D 638 D 638 D 790 D 790 D 1761
Notched Izod Impact:	0.21	ft-lb/in	D 256
Thermal: Coefficient of Linear Expansion:	3.0 x 10 <sup>-5</sup>	in/in/f	D 696
Flammability Standards: Burning Rate: Flame Spread Index: Limited O <sup>2</sup> Index: Heat Deflection Temp: Oil canning:	Failed to ignite 29 41.2 147 Passed	in/min - % O <sup>2</sup> °F -	D 635 E 84 D 2863 D 648 D 648

# 2.3 ACCESSORIES

# A. Fasteners:

- 1. Use stainless steel, smooth shank, screw, annular threaded, or spiral nails. Hot dip galvanized nails may also be used.
- 2. Ring shank nails should not be used due to excessive frictional heat when penetrating the product.
- 3. Staples, small brads and wire nails are not recommended.

- 4. Fasteners should be long enough to penetrate the substrate a minimum of 1 inch.
- 5. Use of power nail guns is acceptable when adjusted to prevent overdriving the nail into the product.
- 6. Use two fasteners per every framing member of trim board applications. Use additional fasteners for trim boards 12 inches or greater.
- 7. Install fasteners no more than 2 inches from the end of the board
- 8. Fasten trim into a flat, solid substrate. Fastening trim into hollow or uneven areas must be avoided.
- 9. Pre-drilling is recommended when using large fasteners or if product is being installed in temperatures below 40 degrees F.

#### B. Adhesives:

- 1. Glue all trim joints with a cellular PVC cement / adhesive approved by the manufacturer.
- Glue joints should be secured with a fastener and/or fastened on each side of the joint to allow adequate bonding time.
- 3. Surfaces to be glued should be smooth, clean and in complete contact with each other.

## C. Sealants:

1. Use urethane, polyurethane or acrylic based sealants without silicone as specified in Section 07920.

## 2.4 FACTORY FINISHES

- 1. There are no factory finishes provided on Cellular PVC Foam Trim and fabricated ornament products.
- 2. No finish paint is required on PVC Foam Trim and Fabricated Ornament Products.
- 3. For finishing on site use a 100% latex paint with a Light Reflectance Value (LRV) of 55% or higher.

4. Follow manufacturer's recommendations for application.

# PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Site Verification of Conditions:
  - 1. Prior to the start of installation, inspect all preceding work to ensure that there are no conditions which will cause an unsatisfactory installation of work involving PVC Foam products.
  - 2. Notify Engineer in writing of any unacceptable condition.
  - 3. Do not install any work involving PVC Foam products until unsatisfactory conditions are corrected and acceptable for proper installation of work.
  - 4. Contractor shall be responsible for correcting or replacing all unacceptable work involving PVC Foam products, which was installed over unsatisfactory conditions at no cost to Owner.

## 3.2 PREPARATION

- A. Protect surrounding and adjacent work as required to prevent damage to preceding work during execution of this work.
- B. Perform all preparation necessary for a successful installation of products as specified in manufacturer's installation instructions.

## 3.3 INSTALLATION

- A. Comply with manufacturer's written instructions applicable to the products and applications indicated in this section.
- B. Coordinate installation of products with other contractors and provide proper accommodation for following work by other trades.

# C. Cutting:

- Use blades that are designed for cutting wood or plastic.
- 2. Carbide tipped blades are recommended.
- 3. Rough-cut blades for wood or plastic may be used.
- 4. Do not use fine tooth blades, which cause excessive heat build-up from friction.

# D. Drilling:

- 1. Use standard wood or metal drill bits.
- 2. Avoid heat build up from friction.
- 3. Drill bits designed for drilling rigid PVC pipe should not be used.

## E. Routing:

- 1. Use standard router bits machining the product.
- 2. Multi-fluted carbide bits are recommended.

# F. Edge Finishing:

1. Edges can be finished by sanding, grinding or filing with standard woodworking tools.

# G. Nail Location:

- 1. Minimum of 16 inch center nailing pattern shall be used to restrict seasonal movement of the product.
- 2. Fasteners shall be kept ¾ inch away from the board edge and staggered slightly to reduce the chance of cracking along the line of fasteners as the material expands and contracts.

## H. Gluing:

1. All joints shall be glued to prevent joint separation. Provide fasteners on each side of the joint to allow adequate bonding time.

- 2. Whenever possible, adhesives should be applied to the backside of the trim at the joints to help hold the trim at the joints forcing it to expand and contract in the center preventing unsightly gaps at the joints.
- 3. When bonding together two smooth or non-machined surfaces of the PVC board clean the surfaces with acetone.
- 4. On long lengths of trim, like corner boards or fascia, a scarf joint should be used.

# I. Thermal Expansion and Contraction:

- 1. Product expands and contracts with changes in temperature.
- 2. Allow 3/16 inch per 18 foot for expansion and contraction.

#### J. Sealant:

1. Use urethane, polyurethane or acrylic based sealants without silicone as specified in Section 07920.

## K. Finishing:

- 1. For small blemishes, file holes with an approved exterior spackling.
- 2. For larger holes or gaps, fill with an approved urethane acrylic sealant.
- 3. This product does not require painting but may be painted to achieve a custom color. A paint color with a Light Reflectance Value (LRC) of 55% or higher is required to avoid excessive solar heating of installed products. Using paint with a LRV of 54% or lower will void the product warranty.
- 4. Follow paint manufacturer's recommendations for applying paint.

### L. Adhesives:

1. Install adhesives at PVC to PVC joints and for fastening in accordance with manufacturer's

recommendations for proper installation of products. Use only adhesives approved for use by manufacturer.

# 3.4 FIELD QUALITY CONTROL

- A. After installation, check all work for flaws and defects.
- B. Repair all defective work.
- C. Remove and replace all damaged components that cannot be successfully repaired as determined by the Engineer.

## 3.5 PROTECTION

A. Install temporary protective materials necessary to prevent significant damage to materials installed in this work. Remove protection when required to permit project completion.

## 3.6 CLEANING

- A. Remove all labels and protection materials.
- B. Clean all surfaces following manufacturer's recommendations prior to final project completion. Do not use harsh cleaning materials or methods that would damage finish.
- C. Dispose properly of all debris generated by this work, protection materials and cleaning materials.

## 3.7 OWNER'S INSTRUCTIONS

A. Follow manufacturer's instructions and recommendations on painting, repairing, and maintaining all material installed under this Section.

++ END OF SECTION ++



## SECTION 06730

## COMPOSITE DECKING AND RAILINGS

# PART 1 - GENERAL

## 1.1 SECTION INCLUDES

- A. Composite decking.
- B. Composite railing.

## 1.2 RELATED SECTIONS

- A. Related Work specified elsewhere:
  - 1. Section 03300, Cast-In-Place Concrete
  - 2. Section 06100, Rough Carpentry

#### 1.3 REFERENCES

- A. ASTM International (ASTM):
  - 1. ASTM D1037: Water Absorption of Plastics.
  - 2. ASTM D1761: Mechanical Fasteners in Wood.
  - 3. ASTM D1413: Test method for Wood Preservatives by Laboratory Soil-block Cultures.
  - 4. ASTM D7031: Standard Guide for Evaluating Mechanical and Physical Properties of Wood-Plastic Composite Products, ASTM International.
  - 5. ASTM D7032: Standard Specification for Establishing Performance Ratings for Wood-Plastic Composite Deck Boards and Guardrail Systems (Guards or Handrails).
  - 6. ASTM E84: Test Method for Surface Burning Characteristics of Building Materials, ASTM International.

# B. Code Reports:

- 1. Nationally Recognized Testing Facilities:
  - a. Intertek:

- 1) CCRR-0301 Trex Enhance Basic and Naturals Decking.
- 2) CCRR-0132 Transcend, Enhance, and Select Railing.
- b. ICC Evaluation Services:
  - 1) ESR-3168 Trex Transcend and Select Decking.
  - 2) ESR-3947 Trex Transcend and Select Railing.

## 1.4 SUBMITTALS

- A. Submit for approval copies of product data, preparation instructions and recommendations, storage and handling requirements, and installation methods.
- B. Shop Drawings: Shop drawings shall include but not be limited to:
- 1. Complete plans, elevations, and details which include layout, spacing, and sizes of decking and railings.
- C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- D. Verification Samples: For each finish product specified, two samples, representing actual product color, size, and finish.

## 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum 5 year experience manufacturing similar products.
- B. Installer Qualifications: Minimum 2 year experience installing similar products.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
  - 1. Finish areas designated by Architect.
  - 2. Do not proceed with remaining work until workmanship is approved by Architect.

3. Refinish mock-up area as required to produce acceptable work.

## 1.6 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to starting work of this section.

# 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
- B. Store products on a flat and level surface. Adjust support blocks accordingly.
- C. Support bundles on supplied dunnage.
- D. When stacking bundles, supports should start approximately 8 inches from each end and be spaced approximately 2 feet on center. Supports shall line up vertically/perpendicular to the decking product.
- E. Do not stack Transcend decking more than 14 bundles. Do not stack Select or Enhance decking more than 12 bundles.
- F. Keep material covered using the provided bundle cover until time of installation.
- G. Handle materials to avoid damage.

# 1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

# 1.9 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

#### 1.10 WARRANTY

A. Provide manufactures warranty against rot, decay,

splitting, checking, splintering, fungal damage, and termite damage for a period of 25 years for a residential installation and 10 years for a commercial installation. In addition provide the Trex Fade and Stain Warranty against food staining and fading beyond 5 Delta E (CIE units) for a period of 25 years for a residential installation and 10 years for a commercial installation.

#### PART 2 PRODUCTS

## 2.1 MANUFACTURERS

- A. Acceptable Manufacturer:
  - 1. Trex Railing and Decking; 160 Exeter Dr., Winchester, VA 22603.
  - 2. Approved equal.

# 2.2 Design/Performance Requirements:

- A. Structural Performance:
  - Deck: Uniform Load 100lbf/sq.ft.
  - 2. Tread of Stairs: Concentrated Load: 750 lbf on area of 4 sq. in., and 1/8 inch maximum deflection at a concentrated load of 300 lbf.
  - 3. Railing: Trex Railing Systems meet various IRC and IBC requirements. Consult the label and published code evaluation reports for the performance levels of each system.
- B. Fire-Surface Burning Characteristics per ASTM E-84.

## 2.3 COMPOSITE DECKING

- A. Wood-Plastic Composite Lumber:
  - Product: Trex Transcend Decking Boards as manufactured by Trex Railing and Decking or approved equal.
  - 2. Material Description: Composite Decking consisting of recycled Linear Low Density Polyethylene (LLDPE) and recycled wood. The product is extruded into

# shapes and sizes as follows:

- a. Width: 1 inch x 5.5 inches (25 mm x 140 mm).
- b. Lengths 12 feet (3658 mm) 16 feet (4877 mm), and 20 feet (6096 mm).
- c. Color To be selected by owner from manufacturer's standard list of colors.
- 3. Physical and Mechanical Properties as follows:
  - a. Flame Spread, ASTM E 84: 70.
  - b. Thermal Expansion, ASTM D 1037: 0.000019 inch/inch/degree F.
  - c. Moisture Absorption, ASTM D 1037: Less than 1percent.
  - d. Screw Withdrawal, ASTM D1761: 588 lbs/in.
  - e. Fungus Resistance, ASTM D1413: Rating no decay.
  - f. Termite Resistance, AWPAE1-72: Rating: 9.6.
  - g. Compression Parallel, ASTM D198: 1588 psi ultimate, 540 psi design.
  - h. Compression Perpendicular, ASTM D143: 1437 psi ultimate, 540 psi design.
  - i. Bending Strength, ASTM D198: 3280 psi ultimate, 500 psi design.
  - j. Shear Strength, ASTM D143: 1761 psi ultimate, 360 psi design.
  - k. Modulus of Elasticity, ASTM D4761: 412,000 psi ultimate, 200,000 psi design.
  - 1. Modulus of Rupture, ASTM D4761: 3280 psi ultimate, 500 psi design.
  - m. Ultimate strength values are not meant for design analysis. Design values are for temperatures up to 125 degree F (52 degree C).
- B. Wood-Plastic Composite Lumber

- 1. Product: Trex Enhance Decking Boards as manufactured by Trex Railing and Decking or approved equal.
- 2. Material Description: Composite Decking consisting of recycled Linear Low Density Polyethylene (LLDPE) and recycled wood. The product is extruded into shapes and sizes as follows:
  - a. Width: 1 inch x 5.5 inches (25 mm x 140 mm).
  - b. Lengths 12 feet (3658 mm) 16 feet (4877 mm), and 20 feet (6096 mm).
  - c. Color to be selected by owner from manufacturer's standard list of colors.
- 3. Physical and Mechanical Properties as follows:
  - a. Flame Spread, ASTM E 84: 125
  - b. Thermal Expansion, ASTM D 1037: 0.000019
    inch/inch/degree F.
  - c. Moisture Absorption, ASTM D 1037: Less than 1 percent.
  - d. Screw Withdrawal, ASTM D1761: 588 lbs/in.
  - e. Fungus Resistance, ASTM D1413: Rating no decay.
  - f. Termite Resistance, AWPAE1-72: Rating: 9.6.
  - g. Compression Parallel, ASTM D198: 1588 psi ultimate, 540 psi design.
  - h. Compression Perpendicular, ASTM D143: 1437 psi ultimate, 540 psi design.
  - i. Bending Strength, ASTM D198: 3280 psi ultimate, 500 psi design.
  - j. Shear Strength, ASTM D143: 1761 psi ultimate, 360 psi design.
  - k. Modulus of Elasticity, ASTM D4761: 412,000psi ultimate, 200,000 psi design.

- 1. Modulus of Rupture, ASTM D4761: 3280 psi ultimate, 500 psi design.
- m. Ultimate strength values are not meant for design analysis. Design values are for temperatures up to 125-degree F (52-degree C).

# C. Wood-Plastic Composite Lumber:

- 1. Product: Select as manufactured by Trex Railing and Decking or approved equal.
- 2. Pattern: Consistent patterns board to board reveal a flawless finish.
- 3. Material Description: Composite Decking consisting of recycled Linear Low Density Polyethylene (LLDPE) and recycled wood. The product is extruded into shapes and sizes as follows:
  - a. Trex Select Decking Boards; 0.875 inches x 5.5 inches (22 mm x 140 mm).
  - b. Lengths 12 feet (3658 mm) 16 feet (4877 mm), and 20 feet (6096 mm).
  - c. Color to be selected by owner from manufacturer' standard list of colors.
- 4. Physical and Mechanical Properties as follows:
  - a. Flame Spread, ASTM E 84: 70.
  - b. Thermal Expansion, ASTM D 1037: 0.000019 inch/inch/degree F.
  - c. Moisture Absorption, ASTM D 1037: Less than
    1.2 percent.
  - d. Screw Withdrawal, ASTM D1761: 388 lbs/in.
  - e. Fungus Resistance, ASTM D1413: Rating no decay.
  - f. Termite Resistance, AWPAE1-72: Rating: 9.7.
  - g. Compression Parallel, ASTM D198: 1588 psi ultimate, 540 psi design.
  - h. Compression Perpendicular, ASTM D143: 1437 psi

- ultimate, 540 psi design.
- i. Bending Strength, ASTM D198: 3280 psi ultimate, 500 psi design.
- j. Shear Strength, ASTM D143: 1761 psi ultimate, 360 psi design.
- k. Modulus of Elasticity, ASTM D4761: 412,000psi ultimate, 200,000 psi design.
- 1. Modulus of Rupture, ASTM D4761: 3280 psi ultimate, 500 psi design.
- m. Ultimate strength values are not meant for design analysis. Design values are for temperatures up to 125 degree F (52 degree C).
- D. Fascia Boards
  - 1. Product: Trex Fascia or approved equal.
- E. Accessory Hardware:
  - 1. Accessory hardware and fasteners per manufacturer's recommendation.

## 2.4 DECK RAILING

- A. Composite Railing:
  - 1. Product:
    - a. Transcend or Select Railing as manufactured by Trex Railing and Decking.
- B. Railing shall be ADA compliant.
- C. Provide all railing post components and hardware.

# PART 3 EXECUTION

## 3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of

another installer, notify Architect of unsatisfactory preparation before proceeding.

# 3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

# 3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions, approved submittals, and in proper relationship with adjacent construction.
- B. Cut, drill, and rout using carbide tipped blades.
- C. Do not use composite wood material for structural applications.

# 3.4 Cleaning

A. Cleaning as required by manufacturer for warranty compliance.

# 3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

+ + END OF SECTION + +



# DIVISION 7 - THERMAL AND MOISTURE PROTECTIONS



# SECTION 07132

## SELF-ADHERING SHEET WATERPROOFING

## PART 1 - GENERAL

# 1.1 SUMMARY

- A. The work of this section includes the application of a self-adhered sheet waterproofing as shown on the Contract Drawings and specified herein, but is not limited to, the following:
  - 1. Rubberized asphalt sheet membrane waterproofing
  - 2. Prefabricated drainage composite
  - 3. Protection board
- B. Related Sections: Other specification sections which directly relate to the work of this section include, but are not limited to, the following:
  - 1. Section 03300, Cast-In-Place Concrete
  - 2. Section 04201, Unit Masonry
  - 4. Section 07600, Flashing and Sheet Metal Trim
  - 5. Section 07920, Caulking and Sealants

## 1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, installation instructions, use limitations and recommendations.
- B. Samples: Submit representative samples of the following for approval:
  - 1. Sheet membrane
  - 2. Protection board
  - 3. Prefabricated drainage composite

- C. Quality Control Submittals:
  - 1. Membrane Waterproofing Manufacturer's Certification:
    - a. Submit a letter certifying that the manufacturer has been actively marketing the submitted system for a minimum of 3 years.
    - b. Submit the names and addresses of 10 previous waterproofing projects. Include the type and size of each project, and name and telephone number of a contact person at the project location.

# 2. Applicator's Certification:

- a. Submit a letter certifying that the applicator has been actively installing waterproofing and/or roofing systems for the past 5 years.
- b. Submit the names and addresses of 5 previous waterproofing and/or roofing projects. Include the type and size of each project, the waterproofing and/or roofing manufacturer's name, and the name and telephone number of a contact person at the project location.
- c. Submit a letter certifying that the supervisor or foreman and the workers applying the waterproofing materials have at least 3 years' experience in the application of waterproofing and/or roofing materials.

## 1.3 REFERENCE STANDARDS

- A. The following standards and publications are applicable to the extent referenced in the text.
  - ASTM 836 Standard Specification for High Solids, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course
  - 2. ASTM D 412 Standard Test Methods for Rubber Properties in Tension
  - 3. ASTM D 570 Standard Test Method for Water Absorption of Plastics

- 4. ASTM D 882 Standard Test Methods for Tensile Properties of Thin Plastic Sheeting
- 5. ASTM D 903 Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
- 6. ASTM D 1876 Standard Test Method for Peel Release of Adhesives (T-Peel)
- 7. ASTM D 1970 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
- 8. ASTM D 3767 Standard Practice for Rubber Measurements of Dimensions
- 9. ASTM D 5385 Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes
- 10. ASTM E 96 Standard Test Methods for Water Vapor Transmission of Materials
- 11. ASTM E 154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

# 1.4 QUALITY ASSURANCE

- A. Manufacturer: Sheet membrane waterproofing shall be manufactured and marketed by a firm with a minimum of 20 years' experience in the production and sales of self-adhesive sheet membrane waterproofing. Manufacturers proposed for use but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past 5 years.
- B. Installer: A firm which has at least 3 years' experience in work of the type required by this section.
- C. Materials: For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer.
- D. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum

working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include review of special details and flashing.

# 1.5 DELIVERY, STORAGE AND HANDLING

- Deliver materials and products in labeled packages. Α. and handle in strict compliance recommendations manufacturer's instructions, and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.
  - 1. Do not double-stack pallets of membrane on the job site. Provide cover on top and all sides, allowing for adequate ventilation.
- B. Sequence deliveries to avoid delays but minimize on-site storage.
- Safety and Handling: Users must read and understand the product label and Safety Data Sheets (SDS's) for each system component before use. All users must acquaint themselves with this information prior to working with the material. Carefully read detailed precaution statements on the product labels and SDS's before use.

## 1.6 PROJECT CONDITIONS

- A. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials and products used.
- B. Proceed with installation only when substrate construction and preparation work is complete and in condition to receive sheet membrane waterproofing.

## 1.7 WARRANTY

A. Sheet Membrane Waterproofing: Provide written 5 year material warranty issued by the membrane manufacturer upon completion of the work.

# PART 2 - PRODUCTS

#### 2.1 MATERIALS

A. Sheet Membrane Waterproofing: BITUTHENE® 3000 Membrane/Low Temperature Membrane as manufactured by GCP Applied Technologies or approved equal; a self-adhesive, cold-applied composite sheet consisting of a thickness of 1.4 mm (0.056 in.) of rubberized asphalt and 0.1 mm (0.004 in.) of cross-laminated, high density polyethylene film. Provide rubberized asphalt membrane covered with a release sheet, which is removed during installation and no special adhesive or heat shall be required to form laps. Provide membrane with the following physical properties:

PHYSICAL PROPERTIES: BITUTHENE® 3000 Membrane & BITUTHENE® LOW TEMPERATURE Membrane

Property	Test Method	Typical Value
Color		Dark gray-black
Thickness	ASTM D 3767 Method A	1.5 mm (0.060 in.) nominal
Flexibility, 180° bend over 25 mm (1 in.) mandrel at -32°C (-25°F)	ASTM D 1970	Unaffected
Tensile Strength, Membrane Die C	ASTM D 412 <sup>1</sup>	2240 kPa (325 psi) minimum
Tensile Strength, Film	ASTM D 8821	34.5 MPa (5,000 psi) minimum
Elongation, Ultimate Failure of Rubberized Asphalt	ASTM D 412 <sup>1</sup>	300% minimum
Crack Cycling at - 32°C (-25°F), 100 Cycles	ASTM C 836	Unaffected
Lap Shear	ASTM D 1002 <sup>2</sup>	89 N (20 lbs) minimum

Property	Test Method	Typical Value
Peel Strength	ASTM D 903	1576 N/m (9 lbs/in.) minimum
Puncture Resistance, Membrane	ASTM E 154	222 N (50 lbs) minimum
Resistance to Hydrostatic Head	ASTM D 5385	>70 m (>230 ft) of water
Permeance	ASTM E 96, Section 12 - Water Method	<0.1 perms
Water Absorption	ASTM D 570	0.1% maximum

## Footnotes:

- 1. The test is run at a rate of 50 mm (2 in.) per minute.
- 2. The test is run at a rate of 102 mm (4 in.) per minute

# 2.2 ANCILLARY PRODUCTS - (WHERE APPLICABLE)

A. Prefabricated Drainage Composite: Drainage Composite: 3/8 inch thick, 3 dimensional, trapazoidal shaped polystyrene drainage core with nonwoven polypropolylene geotextile filter fabric bonded to each core dimple.

HYDRODUCT® 220 and/or HYDRODUCT® 660 Drainage Composite as manufactured by GCP Applied Technologies, or approved equal (to promote positive drainage while serving as a protection course).

## B. Protection Board:

- 1. Expanded Polystyrene Protection Board: 25 mm (1 in.) thick for vertical applications with the following characteristics. Adhere to waterproofing membrane with BITUTHENE®Protection Board Adhesive.
  - a. Normal Density:  $16 \text{ kg/m}^3 (1.0 \text{ lb/ft}^3)$
  - b. Thermal Conductivity, K factor: 0.24 at  $5^{\circ}$ C  $(40^{\circ}\text{F})$ , 0.26 at  $24^{\circ}$ C  $(75^{\circ}\text{F})$
  - c. Thermal Resistance, R-Value: 4 per 25 mm (1
    in.) of thickness.

- 2. Asphalt Hardboard: A premolded semi-rigid protection board consisting of bitumen, mineral core and reinforcement. Provide 3 mm (0.125 in.) thick hardboard on horizontal surfaces not receiving steel reinforced slab. Where steel reinforcing bars are to be used, apply two layers of 3 mm (0.125 in.) thick hardboard or one layer of 6 mm (0.25 in.) thick hardboard.
- C. Waterstop: AdcorTM hydrophilic waterstop as manufactured by GCP Applied Technologies, or approved equal for non-moving concrete construction joints.
- D. Miscellaneous Materials: Surface conditioner, mastic, liquid membrane, tape and accessories specified or acceptable to manufacturer of sheet membrane waterproofing.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

A. The installer shall examine conditions of substrates and other conditions under which this work is to be performed and notify the contractor, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected.

#### 3.2 SUBSTRATE PREPARATION

- A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be structurally sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods which are acceptable to manufacturer of sheet membrane waterproofing.
- B. Cast-In-Place Concrete Substrates:
  - Do not proceed with installation until concrete has properly cured and dried (minimum 7 days for normal structural concrete and minimum 14 days for lightweight structural concrete).

- 2. Fill form tie rod holes with concrete and finish flush with surrounding surface.
- 3. Repair bugholes over 13 mm (0.5 in.) in length and 6 mm (0.25 in.) deep and finish flush with surrounding surface.
- 4. Remove scaling to sound, unaffected concrete and repair exposed area.
- 5. Grind irregular construction joints to suitable flush surface.
- C. Masonry Substrates: Apply waterproofing over concrete block and brick with smooth trowel-cut mortar joints or parge coat.
- D. Wood Substrates: Apply waterproofing membrane over securely fastened sound surface. All joints and fasteners shall be flush to create a smooth surface.
- E. Related Materials: Treat joints and install flashing as recommended by waterproofing manufacturer.

### 3.3 INSTALLATION

- A. Refer to manufacturer's literature for recommendations on installation, including but not limited to, the following:
  - 1. Apply primer at rate recommended by manufacturer. Recoat areas not waterproofed if contaminated by dust. Mask and protect adjoining exposed finish surfaces to protect those surfaces from excessive application of primer.
  - 2. Delay application of membrane until primer is completely dry. Dry time will vary with weather conditions.
  - 3. Seal daily terminations with troweled bead of mastic.
  - 4. Apply protection board and related materials in accordance with manufacturer's recommendations.

# 3.4 FIELD QUALITY CONTROL

A. Inspection and Repair:

- 1. Before the protection board is installed, inspect the membrane in the presence of the Director's Representative. Repair all defects which would impair the waterproofing qualities of the membrane. Defects requiring repairs include, but are not limited to, blisters, wrinkles, fishmouths, cuts, punctures, bridging at corners, insufficient laps at edges and ends, and unadhered membrane.
- 2. Cut out and patch all defects. Extend the patch a minimum of 6 inches beyond the defect in all directions. Apply a trowel coat of mastic around all edges of patch.

# 3.5 CLEANING AND PROTECTION

- A. Protect completed membrane waterproofing from subsequent construction activities as recommended by manufacturer.
- B. Inspect for damage just prior to installation of subsequent construction activities and make repairs in accordance with manufacturer's recommendation.

+ + END OF SECTION + +



## SECTION 07210

## INSULATION

#### PART 1 - GENERAL

#### 1.1 DESCRIPTION

## A. Scope:

- 1. General Contractor shall furnish all labor, materials, equipment and incidentals as required to provide insulation as shown and specified.
- 2. The extent of each type of insulation Work is shown on the Contract Drawings or specified herein.
- 3. The types of insulation required are as shown on the drawings
- B. Related Work Specified Elsewhere:
  - 1. Section 03300, Cast in Place Concrete.
  - 2. Section 06100, Rough Carpentry.

## 1.2 QUALITY ASSURANCE

- A. Design Criteria: Thermal Conductivity: The thicknesses shown are for the thermal resistance (R-Value in accordance with ASTM C 177 or ASTM C 518) specified for each material. The R-Values specified are minimum acceptable. Provide adjusted thicknesses as directed for the use of material having a different thermal resistance.
- B. Requirements of Regulatory Agencies: Comply with fire-resistance and flammability ratings as shown and specified; and comply with applicable requirements of the New York State Uniform Fire Prevention and Building Code.
- C. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:

- 1. ASTM C518, Thermal Conductivity of Materials by Means of Heat Flow Meter.
- 2. ASTM D2842, Water Absorption of Rigid Cellular Plastics.
- 3. ASTM E84, Surface Burning Characteristics of Building Materials.
- 4. ASTM E119, Fire Tests of Building Construction and Materials.
- 5. FS HH-I-521F, Mineral Fiber, Insulation Blanket.
- 6. FS HH-I-558B, Thermal Insulation.
- 7. FS HH-I-574B, Insulation, Thermal (Perlite).
- 8. ASTM E2178 Standard Test Method for Air Permeance of Building Materials leakage rates less than 0.001 L/s/m2 at a test pressure of 75 Pa.
- 9. ASTM E283 Standard Test Method for Determining Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under specified Pressure differences across the specimen. Results were <0.02 L/s/m2.
- 10. 10.ASTM E2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies no leakage.
- 11. ASTM E331 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference no leakage.
- 12. 2018 International Building Code (IBC) Section 2603
- 13. ICC-ES ESR-1659
- 14. THERMAX™ products are covered under Underwriters Laboratories Inc. (UL) File R5622.
- D. Reference standards for rigid insulation:
  - THERMAX™ Sheathing meets ASTM C1289 Standard Specification for Faced Rigid Cellular

Polyisocyanurate Thermal Insulation Board, Type I, Class 2. Applicable standards include:

- a. C203 Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation.
- a. C209 Standard Test Methods for Cellulosic Fiber Insulating Board,
- b. C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus,
- c. D1621 Standard Test Method for Compressive Properties of Rigid Cellular Plastics,
- d. D2126 Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging,
- e. E96 Standard Test Method for Water Vapor Transmission of Materials,
- f. D1623 Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics

### 1.3 SUBMITTALS

A. Manufacturer's Data: Submit for approval copies of manufacturer's specifications and installation instructions for each type of insulation required. Include data substantiating that the materials comply with specified requirements.

# 1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery of Materials: Deliver all materials in unopened, undamaged original packaging bearing the manufacturer's labels.
- B. Storage of Material:
  - Protect insulation materials from becoming wet or soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.

- 2. Handle all materials with proper care to prevent damage from any source.
- 3. Insulation must be kept dry at all times. If stored outside, raise insulation aboveground or roof level on pallets and cover with a tarpaulin or other waterproof material. Plastic wrapping installed and they should not be used as outside storage covers.
- C. Protect insulation materials subject to deterioration by sunlight from exposure to sunlight.
- D. Complete the installation and concealment of insulation materials as rapidly as possible.

### PART 2 - PRODUCTS

# 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Glass-Fiber Insulation:
    - a. CertainTeed Corporation.
    - b. Johns Manville Corporation.
    - c. Owens Corning.
  - 2. Sound Attenuation Batt Insulation (where applicable):
    - a. Owens Corning.
  - 3. Perlite Loose-fill insulation Certified Asbestos Free (expanded volcanic aggregate); ASTM C 549 for use where masonry unit cores are to be filled and also wherever rigid types cannot be successfully installed also for filling inaccessible spaces which cannot be reached by other forms of insulation.:

- a. Producer Members of Perlite Institute Inc. Girefco, Inc.'s Permalite, Schunder Co.'s Perlite, and W.R. Grace & Co.'s Zonolite.
- 4. Closed Cell Poly Foam:
  - a. Expansion Joint flexible Polyethylene foam 3: high closed non crosslinked cells. Plymouth, Nomaco, Bon Tool W.R. Meadows or Equal

### 2.2 INSULATING MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
  - 1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.
  - 2. Insulation shall be installed as shown.
  - 3. Insulation shall conform to Federal Specification HH-I-521F, Type II, Class A.
  - 4. Insulation shall have a minimum R value as specified on the Contract Drawings and shall include a vapor barrier as specified and shown.
- B. Mineral Fiber Insulation: Glass or other inorganic fibers and resinous binders formed into flexible blankets, batts or rolls; ASTM C 665
- C. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and density indicated below, with maxim um flamespread and smoke-developed indices of 75 and 450, respectively:
  - 1. Type X, 1.30 lb/cu. Ft
- D. Sound Attenuation Batt Insulation: ASTM C 665 Type I, ASTM E 136, unfaced, lightweight, flexible fiberglass insulation batts designed to deliver noise control in metal stud wall cavities of interior partitions of manufacturer's type and specifications as indicated below:

- 1. QuietZone Sound Attenuation Batt Insulation as manufactured by Owens Corning.
- E. Foil-Faced, Polyisocyanurate Board Insulation: ASTM C 1289, Type I, Class 1, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, based on tests performed on unfaced core on thicknesses up to 4 inches. Minimum thermal resistance of 19.2 deg F x h x sq. ft/Btu at 75 deg F. Glass-fiber-infused polyisocyanurate foam core laminated between 1.0 mil smooth, reflective aluminum facers on both sides.

## 1. Manufacturers:

- a. DuPont
- b. Atlas Roofing Corporation.
- c. Dow Chemical Company.
- d. Rmax, Inc.
- F. Perlite Loose-Fill Insulation: ASTM C 549, Type II (surface treated for water repellency and limited moisture absorption) or Type IV (surface treated for water repellency and limited dust generation during application), with a thermal resistance for 4.1- to 7.4-lb/cu. ft insulation of 3.3 to 2.8 deg F x h x sq. ft/Btu at 75 deg F for 1-inch thickness.
- G. Closed Cell Poly Foam: ½" expanded polyethelene, flexible foam expansion joint filler. ASTM C518-85 with a thermal resistance of 3.05 hr/ftA2 \*f/btu/in must use SNAP CAP.
- H. Adhesive for Bonding Insulation: The type recommended by the insulation manufacturer.
- I. Mechanical Anchors: Type and size shown or, if not shown, as recommended by the insulation manufacturer for the type of application shown and condition of substrate.
- J. Vapor Barrier: Polyethylene sheeting; ASTM D 4397; 6 mils minimum thickness, 3.7 g/m2 per 24 hr maximum water vapor transmission rate.

### PART 3 - EXECUTION

### 3.1 INSPECTION

- A. Contractor shall examine the substrate and conditions under which the insulation Work is to be performed and notify the Engineer in writing of unsatisfactory conditions. Do not proceed with the insulation Work until unsatisfactory conditions have been corrected in a manner acceptable to the Engineer.
- B. Verify that adjacent materials are dry and ready to receive insulation.

#### 3.2 INSTALLATION

#### A. General:

- Comply with manufacturer's instructions for the particular conditions of installation in each case. If printed instructions are not available or do not apply to the project conditions, consult the manufacturer's technical representative for specific recommendations before proceeding with the work.
- 2. Extend insulation full thickness over entire surface to be insulated. Apply a single layer of insulation of the required thickness, unless otherwise indicated or required to make up the total thickness. Cut and fit tightly around obstructions, and fill voids with insulation.
  - a. Do not place insulation over, or within 3 inches of recessed lighting fixtures.
- 3. Install insulation with factory applied barrier membrane facing the warm side of building spaces. Tape ruptures in barrier membrane.
- 4. Install separate polyethylene sheeting vapor barrier where shown, in accordance with manufacturer's printed instructions. Lap all seams and joints a minimum of 6 inches.

# 3.3 INSPECTION AND ACCEPTANCE

A. Insulation which has become wet, damaged, or deteriorated, as determined by the Engineer, shall be promptly removed from the job.

+ + END OF SECTION + +

### SECTION 07230

### PERIMETER AND UNDER-SLAB INSULATION

## PART 1 - GENERAL

# 1.1 DESCRIPTION

A. Under this Section, the General Contractor shall furnish all labor, materials and equipment for Perimeter and Under-Slab Insulation, as shown on the Plans, as specified, and/or directed.

#### 1.2 REFERENCES

- A. The publications listed below and their latest revisions form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 1. American Society for Testing and Materials (ASTM) Publications:
    - a. C552 Cellular Glass Thermal Insulation
    - b. C578 Rigid, Cellular Polystyrene Thermal Insulation
    - c. C591 Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
    - d. C1289 Faced Rigid Cellular Polyisocyanurate
      Thermal Insulation Board

# 1.3 SUBMITTALS

- A. Manufacturer's Catalog Data: Manufacturer's Data: Include descriptive literature, and recommended instructions on installation methods and procedures for the following:
  - 1. Insulation

### 1.4 DELIVERY, STORAGE AND HANDLING

A. Do not allow insulation materials to become wet or soiled, or covered with ice and snow. Comply with

- manufacturer's recommendations for handling, storage, and protection during installation.
- B. Do not deliver flammable insulation materials to the project site more than 2 days ahead of time of installation. Protect at all times against ignition.
- C. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Complete the installation and concealment of insulation materials as rapidly as possible.

### 1.5 PROJECT CONDITIONS

- A. Do not proceed with the installation of insulation on walls or under slabs until the Work which follows (and which conceals the insulation) is ready to be performed.
- B. Examination of Substrate: Examine the substrate and the conditions under which the insulation work until unsatisfactory conditions have been corrected.

## PART 2 - PRODUCTS

### 2.1 RIGID FORM-PLASTIC BOARD INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and density indicated below, with maximum flamespread and smoke-developed indexes of 75 and 450, respectively:
  - 1. Available Manufacturers:
    - a. DiversiFoam.
    - b. Dow Chemical Company.
    - c. Owens Corning.
    - d. Pactiv Building Products Division.
    - e. Or Equal.

- 2. Type V, 3.0 lb/cu. ft.
- 3. Aged R-value:
  - a. 2 Inches Thick: R = 10.0 @ 40 degrees F and 10.0 @ 75 degrees F.
- 4. Edges and Ends: Square or tongue-and-groove at manufacturer's option.

## 2.2 VAPOR RETARDERS

- A. Polyethylene Vapor Retarders: ASTM D 4397, 6 mils (0.15 mm) thick, with maximum permeance rating of 0.13 perm (7.5 ng/Pa x s x sq. m).
- B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

#### 2.3 AUXILIARY INSULATING MATERIALS

A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

B. Remove all protrusions, form ties, and fill all holes and honeycombing in the foundation wall to ensure a smooth surface. Clean surface of all debris and materials.

### 3.3 INSTALLATION, GENERAL

- A. Install frames plumb, level, rigid, and in true alignment in accordance with ANSI. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.
- C. Extend insulation in thickness indicated 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. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- E. For performed insulating units, 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.

### 3.4 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION

- A. Prior to backfilling, install rigid insulation to the exterior, from top of footing to the full height of the foundation wall, compliant with the Building Code.
- B. On vertical surfaces, set insulation units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.
  - If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line.

- 2. Adhere insulation with long edges horizontal, edges tightly butted and vertical joints staggered. Joints and openings may be sealed with foam joint tape. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating the insulation with joint tape.
- 3. Secure insulation with construction adhesive compatible with polystyrene or foamed plastics as recommended by the manufacturer.
- 4. Apply insulation to wall within 15 minutes after adhesive is applied.
- C. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
- D. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection course with joints butted. Set in adhesive according to insulation manufacturer's written instructions.
- E. Protect top surface of horizontal insulation from damage during concrete work by applying protection course with joints butted.

## 3.5 CLEANUP

A. After completion of building insulation installation, Contractor is responsible for cleaning up and disposing of all building insulation materials.

+ + END OF SECTION ++



### SECTION 07241

# EXTERIOR INSULATION AND FINISH SYSTEMS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Exterior insulation and finish system (EIFS) applied over the following:
    - a. Gypsum sheathing.

#### 1.3 DEFINITIONS

- A. EIFS: Exterior insulation and finish system(s).
- B. Class PB EIFS: A "nonload bearing, exterior wall cladding system that consists of an insulation board attached either adhesively, mechanically, or both to the substrate; an integrally reinforced base coat; and a textured protective finish coat," as defined by ASTM C 1397.

### 1.4 PERFORMANCE REQUIREMENTS

- A. EIFS Performance: Comply with the following:
  - 1. Bond Integrity: Free from bond failure within EIFS components or between system and supporting wall construction, resulting from exposure to fire, wind loads, weather, or other in-service conditions.
  - Weathertightness: Resistant to water penetration from exterior into EIFS and assemblies behind it or through them into interior of building that results in deterioration of thermal-insulating

effectiveness or other degradation of EIFS and assemblies behind it, including substrates, supporting wall construction, and interior finish.

- B. Class PB EIFS: Provide EIFS having physical properties and structural performance that comply with the following when tested per methods referenced:
  - 1. Abrasion Resistance: Sample consisting of 1-inch-thick EIFS mounted on 1/2-inch-thick gypsum board; cured for a minimum of 28 days; and showing no cracking, checking, or loss of film integrity after exposure to 528 quarts of sand when tested per ASTM D 968, Method A.
  - 2. Accelerated Weathering Characteristics: Sample of size suitable for test equipment and consisting of 1-inch- thick EIFS mounted on 1/2-inch- thick gypsum board; cured for 28 days; and showing no cracking, checking, crazing, erosion, rusting, blistering, peeling, or delamination after testing for 2000 hours when viewed under 5 times magnification per ASTM G 23, Method 1.
  - 3. Absorption-Freeze Resistance: No visible deleterious effects and negligible weight loss after 60 cycles per EIMA 101.01.
  - 4. Mildew Resistance of Finish Coat: Sample applied to 2-by-2-inch clean glass substrate, cured for 28 days, and showing no growth when tested per ASTM D 3273.
  - 5. Salt-Spray Resistance: Sample consisting of 1-inch-thick EIFS mounted on 1/2-inch-thick gypsum board; cured for 28 days; and showing no cracking, checking, crazing, erosion, rusting, blistering, peeling, or delamination after testing for 300 hours per ASTM B 117.
  - 6. Tensile Adhesion: No failure in the adhesive, base coat, or finish coat. Minimum 5-psi tensile strength before and after freeze-thaw and accelerated weathering tests per EIMA 101.03.
  - 7. Water Penetration: Sample consisting of 1-inch-thick EIFS mounted on 1/2-inch- (12.7-mm-) thick

gypsum board, cured for 28 days, and showing no water penetration into the plane of the base coat to expanded polystyrene board interface of the test specimen after 15 minutes at 6.24 lbf/sq. ft. of air pressure difference or 20 percent of positive design wind pressure, whichever is greater, across the specimen during a test period when tested per EIMA 101.02.

- 8. Water Resistance: Sample consisting of 1-inchthick EIFS mounted on 1/2-inchthick gypsum board; cured for 28 days; and showing no cracking, checking, crazing, erosion, rusting, blistering, peeling, or delamination after testing for 14 days per ASTM D 2247.
- 9. Impact Resistance: Sample consisting of 1-inch-thick EIFS when constructed, conditioned, and tested per EIMA 101.86; and meeting or exceeding the following impact classification and range:
  - a. Medium Impact Resistance: 50 to 89 inch-lb.
- 10. Positive and Negative Wind-Load Performance: Sample assembly, 48 by 48 inches in size, consisting of studs, sheathing, and 1-inch-thick EIFS; and showing capability to withstand wind loads indicated when tested per ASTM E 330.
- 11. Drainage: 3 samples capable of draining water, and having an average minimum true drainage efficiency of 90 percent when tested per EIMA 200.2.
- C. Water-/Weather-Resistive-Barrier Coating: With physical properties that comply with the following when tested on substrate per methods referenced:
  - 1. Tensile Adhesion: No failure in bond when 5 samples of water-/weather-resistive coating are applied to substrate and tested at a minimum 15-psi flatwise tensile strength per ASTM C 297.
  - 2. Absorption-Freeze Resistance: No visible deleterious effects and negligible weight loss after 60 cycles per EIMA 101.01.

- 3. Water Penetration: 3 samples each sized not less than 4 by 8 feet; consisting of coating applied to substrate including a minimum of 2 vertical joints and 1 horizontal joint within sheathing substrate, each joint not less than 0.125 inch wide; and tested sequentially as follows:
  - a. Passing 10 cycles at 80 percent positive design load (design load is defined as ultimate load with a safety factor of 3.0 imposed) as the maximum test load when tested in accordance with ASTM E 1233, Procedure A.
  - b. No water penetration on the plane of the exterior-facing side of substrate after 75 minutes at 6.24 lbf/sq. ft. of air-pressure difference or 20 percent of positive design wind pressure, whichever is greater, across the specimen during a test period when tested per ASTM E 331.
- 4. Water Resistance: 3 samples, each sized not less than 4 by 6 inches and consisting of coating applied to substrate, showing no cracking, checking, crazing, erosion, blistering, peeling, or delamination after testing for 14 days per ASTM D 2247.
- 5. Water Vapor Transmission: Three samples prepared by applying the coating, at recommended thickness, to a nonadhesive surface and removing cured coating film. Average thickness is determined from material density, area, and weight and samples are tested per ASTM E 96 after conditioning at 75 plus or minus 5 deg F and 50 percent relative humidity for 40 hours before testing, with results meeting or exceeding grade requirements in Table 14-1-A of UBC Standard 14-1
- D. Performance of Prefabricated Panels: Capable of withstanding the effects of normal thermal movement, gravity loads, and the following loads and stresses within limits and under conditions indicated:
  - 1. Wind Loads: Uniform pressure as indicated on Drawings.

- 2. Normal thermal movement is defined as that resulting from the following maximum change (range) in ambient temperature. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - a. Temperature Change (Range): 100 deg F.
- 3. Deflection: Limit deflection of framing members to L/240.

## 1.5 SUBMITTALS

- A. Product Data: For each type and component of EIFS indicated.
- B. Samples for Initial Selection: For each type of finish-coat color and texture indicated.
  - 1. Include similar samples of joint sealants and exposed accessories involving color selection.
- C. Samples for Verification: 24-inch- square panels for each type of finish-coat color and texture indicated, prepared using same tools and techniques intended for actual work including a typical control joint filled with sealant of color selected.
  - 1. Include sealants and samples to verify color selected.
- D. Manufacturer Certificates: Signed by manufacturers certifying that EIFS and joint sealants comply with requirements.
- E. Qualification Data: For Installer and testing agency.
- F. Material Test Reports: For each insulation, reinforcing mesh and coating.
- G. Material Certificates: For cementitious materials and aggregates and for each insulation and joint sealant, signed by manufacturers or a third-party agency approved by EIFS manufacturer.
- H. Compatibility and Adhesion Test Reports: For joint sealants from sealant manufacturer indicating the following:

- 1. Materials forming joint substrates and jointsealant backings have been tested for compatibility and adhesion with joint sealants.
- 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- I. Field quality-control test reports.
- J. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for EIFS.
- K. Maintenance Data: For EIFS to include in maintenance manuals.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An installer who is certified in writing by EIFS manufacturer as qualified to install manufacturer's system using trained workers.
  - 1. Installer's responsibilities include fabricating and installing prefabricated panels and providing professional engineering services needed to assume engineering responsibility.
  - 2. Fabricator/Erector Qualifications: Certified in writing by EIFS manufacturer as qualified to fabricate and erect manufacturer's prefabricated panel system using skilled and trained workers.
  - 3. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
- B. Source Limitations: Obtain EIFS through one source from a single EIFS manufacturer and from sources approved by EIFS manufacturer as compatible with system components.
- C. Fire-Test-Response Characteristics: Provide EIFS and system components with the following fire-test-response characteristics as determined by testing identical EIFS and system components per test method indicated below by UL or another testing and

inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting agency.

- 1. Fire-Resistance Characteristics: Provide materials and construction tested for fire resistance per ASTM E 119.
- 2. Full-Scale, Multistory Fire Test: Tested mockup, representative of completed multistory wall assembly of which EIFS is a part, complies with UBC Standard 26-4 or UBC Standard 26-9 for test method and required fire-test-response characteristics of exterior non-load-bearing wall panel assemblies containing foam-plastic insulation.
- 3. Full-Scale Fire Test: Tested mockup, in form indicated below, that represents completed wall assembly of which EIFS is a part, shows no tendency to propagate flame over the surface or through finish to core, or to cause delamination of finish when vertically mounted exterior face is exposed 15 minutes to a fire source using flame-spread test per ASTM E 108 modified for testing vertical walls as indicated below:
  - a. Provide 2 panels, 72 by 120 inches, consisting of protective finish coat and 4-. inch- thick insulation applied to 1/2-inch-thick gypsum board; cured for 28 days; with protective finish coat removed to leave surface of insulation exposed on 1 panel in an area 4 inches high by 24 inches wide and centered 24 inches above bottom edge of panel.
- 4. Radiant Heat Exposure: No ignition of EIFS when tested according to NFPA 268.
- 5. Surface-Burning Characteristics: Provide insulation board, adhesives, base coats, and finish coats with flame-spread index of 25 or less and smoke-developed index of 450 or less, per.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic

effects and set quality standards for materials and execution and set quality standards for fabrication and installation.

- 1. Approval of mockups is also for other material and construction qualities specifically approved by Engineer in writing.
- 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Engineer in writing.
- 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original, unopened packages with manufacturers' labels intact and clearly identifying products.
- B. Store materials inside and under cover; keep them dry and protected from weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic, and other causes.
  - 1. Stack insulation board flat and off the ground.
  - 2. Protect plastic insulation against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
  - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## 1.8 PROJECT CONDITIONS

A. Weather Limitations: Maintain ambient temperatures above 40 deg F for a minimum of 24 hours before, during, and after adhesives or coatings are applied. Do not apply EIFS adhesives or coatings during

- rainfall. Proceed with installation only when existing and forecasted weather conditions and ambient outdoor air and substrate temperatures permit EIFS to be applied, dried, and cured according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify actual dimensions required for prefabricated panels by field measurements before fabrication and indicate measurements on Shop Drawings.
  - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating prefabricated panels without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

#### 1.9 COORDINATION

- A. Coordinate installation of EIFS with related Work specified in other Sections to ensure that wall assemblies, including sheathing, flashing, trim, joint sealants, windows, and doors, are protected against damage from the effects of weather, age, corrosion, moisture, and other causes. Do not allow water to penetrate behind flashing and protective coating of barrier EIFS.
- B. Coordinate panel fabrication schedule with construction progress to avoid delaying the Work.

#### PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1. Class PB EIFS:
  - a. Sto Corp.
  - b. Dryvit Systems, Inc.
  - c. Master Wall, Inc.

## 2.2 MATERIALS

- A. Compatibility: Provide substrates, water-/weather-resistive barriers, adhesive, fasteners, board insulation, reinforcing meshes, base- and finish-coat systems, sealants, and accessories that are compatible with one another and approved for use by EIFS manufacturer for Project.
- B. Colors, Textures, and Patterns of Finish Coat: STO Granitex spray applied surface finish or approved equal.
  - 1. Fasteners: Wafer-head or hard-roc steel drill screws complying with ASTM C 954, with an organic-polymer coating or other corrosion-protective coating having a salt-spray resistance of more than 500 hours per ASTM B 117.
    - a. Size and Length: As recommended by sheathing manufacturer for type and thickness of sheathing board to be attached.
- C. Water-/Weather-Resistive Barrier: Provide one of the following:
  - 1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), without perforations.
  - 2. Water-/Weather-Resistive-Barrier Coating: EIFS manufacturer's standard formulation and accessories designed for indicated use, compatible with substrate, and complying with performance requirements indicated.
    - a. Sheathing Joint Compound and Tape: Type recommended by EIFS manufacturer for sealing joints between and penetrations through sheathing.

- 3. Polymer-Based Building Wrap: ASTM E 1677, Type I air retarder; with flame-spread and smokedeveloped indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; and UV stabilized; with pressure-sensitive plastic tape recommended by building wrap manufacturer for sealing joints between and penetrations through building wrap.
  - a. Product: Subject to compliance with requirements, provide "Tyvek StuccoWrap" by DuPont Tyvek Weatherization Systems (E. I. duPont de Nemours and Company).
- D. Primer/Sealer: EIFS manufacturer's standard substrate conditioner designed to seal substrates from moisture penetration and to improve the bond between substrate of type indicated and adhesive used for application of insulation.
- E. Flexible-Membrane Flashing: Cold-applied, fully self-adhering, self-healing, rubberized-asphalt and polyethylene-film composite sheet or tape and primer; EIFS manufacturer's standard or product recommended in writing by EIFS manufacturer.
- F. Drainage Mat: Woven or fused, self-furring PVC mesh lathmat designed to drain incidental moisture by gravity; EIFS manufacturer's standard or product recommended in writing by EIFS manufacturer with manufacturer's standard corrosion-resistant mechanical fasteners suitable for intended substrate.
- G. Spacers: Woven or fused, self-furring PVC mesh lath furring strips; EIFS manufacturer's standard or product recommended in writing by EIFS manufacturer with manufacturer's standard corrosion-resistant mechanical fasteners suitable for intended substrate.
- H. Adhesive for Application of Insulation: EIFS manufacturer's standard formulation designed for indicated use, compatible with substrate, and complying with one of the following requirements:
  - 1. Job-mixed formulation of portland cement complying with ASTM C 150, Type I, and polymer-based adhesive specified for base coat.

- 2. Factory-blended dry formulation of portland cement, dry polymer admixture, and fillers specified for base coat.
- I. Molded, Rigid Cellular Polystyrene Board Insulation:
  Comply with EIFS manufacturer's requirements,
  ASTM C 578 for Type I, and EIMA's "EIMA Guideline
  Specification for Expanded Polystyrene (EPS)
  Insulation Board" for more stringent requirements for
  material performance and qualities of insulation,
  including dimensions and permissible variations, and
  the following:
  - 1. Aging: Before cutting and shipping, age insulation in block form by air drying for not less than six weeks or by another method approved by EIMA that produces equivalent results.
  - 2. Flame-Spread and Smoke-Developed Indexes: 25 and 450 or less, respectively, per ASTM E 84.
  - 3. Dimensions: Provide insulation boards not more than 24 by 48 inches and in thickness indicated but not more than 4 inches thick or less than thickness allowed by ASTM C 1397.
  - 4. Channeled Board Insulation: EIFS manufacturer's standard factory-fabricated profile with linear, vertical drainage channels, slots, or waves on the back side of board.
  - 5. Board Insulation Closure Blocks: EIFS manufacturer's standard density, size, and configuration.
- J. Glass-Fiber-Faced, Rigid Cellular Polyisocyanurate Board Insulation: ASTM C 1289, Type II, with an alkali-resistant glass-fiber facing on both faces.
  - 1. Flame-Spread and Smoke-Developed Indexes: 75 and 450 or less, respectively, per ASTM E 84.
  - 2. Dimensions: Provide insulation boards not more than 24 by 48 inches and in thickness indicated but not more than 4 inches thick or less than thickness allowed by EIFS manufacturer.

- K. Reinforcing Mesh: Balanced, alkali-resistant, open-weave glass-fiber mesh treated for compatibility with other EIFS materials, made from continuous multiend strands with retained mesh tensile strength of not less than 120 lbf/in. per EIMA 105.01, complying with ASTM D 578 and the following requirements for minimum weight:
  - 1. Intermediate-Impact Reinforcing Mesh: Not less than 12.0 oz./sq. yd..
  - 2. High-Impact Reinforcing Mesh: Not less than 15 oz./sq. yd..
  - 3. Heavy-Duty Reinforcing Mesh: Not less than 20 oz./sq. yd..
  - 4. Strip Reinforcing Mesh: Not less than 3.75 oz./sq. yd..
  - 5. Detail Reinforcing Mesh: Not less than 4.0 oz./sq. yd..
  - 6. Corner Reinforcing Mesh: Not less than 7.2 oz./sq. yd..
- L. Base-Coat Materials: EIFS manufacturer's standard mixture complying with one of the following requirements for material composition and method of combining materials:
  - 1. Job-mixed formulation of portland cement complying with ASTM C 150, Type I, white or natural color; and manufacturer's standard polymer-emulsion adhesive designed for use indicated.
  - 2. Factory-blended dry formulation of portland cement, dry polymer admixture, and inert fillers to which only water is added at Project site.
- M. Waterproof Adhesive/Base-Coat Materials: EIFS manufacturer's standard waterproof mixture complying with the following requirements for material composition and method of combining materials:
  - 1. Job-mixed formulation of portland cement complying with ASTM C 150, Type I, white or

natural color; and manufacturer's standard polymer-emulsion adhesive designed for use indicated.

- N. Primer: EIFS manufacturer's standard factory-mixed elastomeric-polymer primer for preparing base-coat surface for application of finish coat.
- O. Finish-Coat Materials: EIFS manufacturer's standard acrylic-based coating with enhanced mildew resistance complying with the following requirements for material composition and method of combining materials:
  - 1. Factory-mixed formulation of polymer-emulsion binder, colorfast mineral pigments, sound stone particles, and fillers.
  - 2. Sealer: Manufacturer's waterproof, clear acrylic-based sealer for protecting finish coat.
- P. Water: Potable.
- Q. Mechanical Fasteners: EIFS manufacturer's standard corrosion-resistant fasteners consisting of thermal cap, standard washer and shaft attachments, and fastener indicated below; selected for properties of pullout, tensile, and shear strength required to resist design loads of application indicated; capable of pulling fastener head below surface of insulation board; and of the following description:
  - 1. For attachment to steel studs from 0.033 to 0.112 inch in thickness, provide steel drill screws complying with ASTM C 954.
  - 2. For attachment to light-gage steel framing members not less than 0.0179 inch in thickness, provide steel drill screws complying with ASTM C 1002.
  - 3. For attachment to masonry and concrete substrates, provide sheathing dowel in form of a plastic wing-tipped fastener with thermal cap, sized to fit insulation thickness indicated and to penetrate substrate to depth required to secure anchorage.

- R. Trim Accessories: Type as designated or required to suit conditions indicated and to comply with EIFS manufacturer's written requirements; manufactured from UV-stabilized PVC; and complying with ASTM D 1784, manufacturer's standard Cell Class for use intended, and ASTM C 1063.
  - 1. Casing Bead: Prefabricated one-piece type for attachment behind insulation, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
  - 2. Drip Screed/Track: Prefabricated one-piece type for attachment behind insulation with face leg extended to form a drip, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
  - 3. Weep Screed/Track: Prefabricated one-piece type for attachment behind insulation with perforated face leg and weep holes in track bottom, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg; designed to drain incidental moisture that gets into wall construction to the exterior at terminations of EIFS with drainage.
  - 4. Expansion Joint: Prefabricated one-piece V profile; designed to relieve stress of movement.
  - 5. Sill Flashing: Prefabricated type for both flashing and sloping sill over framing beneath windows; with end and back dams; designed to direct water to exterior.

## 2.3 ELASTOMERIC SEALANTS

A. Elastomeric Sealant Products: Provide EIFS manufacturer's listed and recommended chemically curing, elastomeric sealant that is compatible with joint fillers, joint substrates, and other related materials, and complies with requirements for products and testing indicated in EIMA's "EIMA Guide for Use of Sealants with Exterior Insulation and Finish Systems, Class PB" and with requirements in Division 7 Section

- "Joint Sealants" for products corresponding to description indicated below:
- Low-modulus, multicomponent, nonsag urethane sealant.
- 2. Low-modulus, nonacid-curing silicone sealant.
- B. Preformed Foam Sealant Products: Provide sealant compatible with adjacent materials and complying with requirements in Division 7 Section "Joint Sealants."
- C. Sealant Color: As selected by Engineer from manufacturer's full range.

#### 2.4 MIXING

A. General: Comply with EIFS manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials except as recommended by EIFS manufacturer. Mix materials in clean containers. Use materials within time period specified by EIFS manufacturer or discard.

#### 2.5 PANEL FABRICATION

- A. Panel Framing: Fabricate panel framing to comply with requirements in Division 5 Section "Cold-Formed Metal Framing."
  - 1. Connect panel framing by welding, unless otherwise indicated.
  - 2. Connections: Provide connections capable of adjustment, complying with erection tolerance requirements, to anchor panels to structure.
- B. Exterior Cement Board: Install on metal framing to comply with requirements in Part 3 "Exterior Cement-Board Installation" Article.
- C. EIFS Application: Apply EIFS to sheathed metal-framed panels to comply with requirements in Part 3 "EIFS Installation" Article.
  - Wrap base coat and reinforcing mesh at edges of panels and extend coverage not less than 4 inches over backs of panels, unless otherwise indicated.

 Continue finish coat around corners at edges of panels, unless otherwise indicated, and extend to location indicated for sealant application. Do not extend finish coat over surfaces where sealant will be applied.

### PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of EIFS.
- B. Examine roof edges, wall framing, flashings, openings, substrates, and junctures at other construction for suitable conditions where EIFS will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Protect contiguous work from moisture deterioration and soiling caused by application of EIFS. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.
- B. Protect EIFS, substrates, and wall construction behind them from inclement weather during installation. Prevent penetration of moisture behind drainage plane of EIFS and deterioration of substrates.
- C. Prepare and clean substrates to comply with EIFS manufacturer's written requirements to obtain optimum bond between substrate and adhesive for insulation.
- D. Primer/Sealer: Apply over gypsum sheathing substrates to protect substrates from degradation and where required by EIFS manufacturer for improving adhesion of insulation to substrate.
- E. Water-/Weather-Resistive-Barrier Coating: Apply over substrates to protect substrates from degradation and to provide water-/weather-resistive barrier.

- 1. Tape and seal joints, exposed edges, terminations, and inside and outside corners of sheathing, unless otherwise indicated by EIFS manufacturer's written instructions.
- F. Waterproof Adhesive/Base Coat: Apply over substrates to protect substrates from degradation.
- G. Flexible-Membrane Flashing: Install over weatherresistive barrier, applied and lapped to shed water;
  seal at openings, penetrations, terminations, and
  where indicated by EIFS manufacturer's written
  instructions to protect wall assembly from
  degradation. Prime substrates, if required, and
  install flashing to comply with EIFS manufacturer's
  written instructions and details.

#### 3.3 EXTERIOR CEMENT-BOARD INSTALLATION

- A. Water-/Weather-Resistive Barrier: Wrap into wall openings, such as for mechanical equipment; lap with flashing to drain in the direction of flow. Extend continuously around corners and angles and behind control joints. Overlap upstanding vertical flashing/trim a minimum of 4 inches to shed water, unless otherwise indicated. Do not make holes, breaks, or tears in the barrier except by fasteners.
  - 1. Asphalt-Saturated Organic Felt: Install a layer between exterior cement board and studs according to requirements of authorities having jurisdiction. Overlap to drain in the direction of flow. Apply horizontally with 2-inch overlap and 6-inch staggered end lap; fasten to sheathing with galvanized staples or roofing nails.
  - 2. Polymer-Based Building Wrap: Comply with manufacturer's written installation instructions.
- B. Exterior Cement Board: Install on metal framing to comply with cement-board manufacturer's written instructions and research/evaluation report acceptable to authorities having jurisdiction. Install board with steel drill screws spaced no more than 8 inches o.c. along framing with perimeter fasteners at least 3/8 inch but less than 5/8 inch from edges of boards.

## 3.4 EIFS INSTALLATION

- A. General: Comply with ASTM C 1397 and EIFS manufacturer's written instructions for installation of EIFS as applicable to each type of substrate indicated.
- B. Trim: Apply trim accessories at perimeter of EIFS, at expansion joints, at sills, and elsewhere as indicated, according to EIFS manufacturer's written instructions. Coordinate with installation of insulation.
  - Drip Screed/Track: Use at bottom edges of EIFS, unless otherwise indicated.
  - 2. Weep Screed/Track: Use at bottom termination edges, at window and door heads of EIFS with drainage, unless otherwise indicated.
  - 3. Sill Flashing: Use at windows, unless otherwise indicated.
  - 4. Expansion Joint: Use where indicated on Drawings.
  - 5. Casing Bead: Use at other locations.
- C. Drainage Mat: Apply wrinkle free, continuously, with edges mechanically secured with fasteners over water-/weather-resistive barrier according to manufacturer's written instructions.
- D. Board Insulation: Adhesively and mechanically attach insulation to substrate in compliance with ASTM C 1397, EIFS manufacturer's written requirements, and the following:
  - 1. Apply adhesive to insulation by notched-trowel method in a manner that results in coating the entire surface of sheathing with adhesive once insulation is adhered to sheathing unless EIFS manufacturer's written instructions specify using primer/sealer with ribbon-and-dab method. Apply adhesive to a thickness of not less than 1/4 inch for factory mixed and not less than 3/8 inch for field mixed, measured from surface of insulation before placement.

- 2. Apply adhesive to ridges on back of insulation by notched-trowel method in a manner that results in full adhesive contact over the entire surface of ridges, leaving channels free of adhesive once insulation is adhered to substrate.
- 3. Press and slide insulation into place. Apply pressure over the entire surface of insulation to accomplish uniform contact, high initial grab, and overall level surface.
- 4. Allow adhered insulation to remain undisturbed for period recommended by EIFS manufacturer, but not less than 24 hours, before beginning rasping and sanding insulation, or applying base coat and reinforcing mesh.
- 5. Mechanically attach insulation to substrate by method complying with EIFS manufacturer's written requirements. Install top surface of fastener heads flush with plane of insulation. Install fasteners into or through substrates with the following minimum penetration:
  - a. Steel Framing: 5/16 inch.
  - b. Concrete and Masonry: 1 inch.
- 6. Apply insulation over dry substrates in courses with long edges of boards oriented horizontally.
- 7. Begin first course of insulation from screed/track and work upward. Work from perimeter casing beads toward interior of panels if possible.
- 8. Stagger vertical joints of insulation boards in successive courses to produce running bond pattern. Locate joints so no piece of insulation is less than 12 inches wide or 6 inches high. Offset joints not less than 6 inches from corners of openings.
  - a. Adhesive Attachment: Offset joints of insulation not less than 6 inches from horizontal and 4 inches from vertical joints in sheathing.

- b. Mechanical Attachment: Offset joints of insulation from horizontal joints in sheathing.
- 9. Place insulation with adhesive strips and channels, slots, or waves aligned in the vertical position for drainage.
- 10. Interlock ends at internal and external corners.
- 11. Abut insulation tightly at joints within and between each course to produce flush, continuously even surfaces without gaps or raised edges between boards. If gaps greater than 1/16 inch occur, fill with insulation cut to fit gaps exactly; insert insulation without using adhesive or other material.
- 12. Cut insulation to fit openings, corners, and projections precisely and to produce edges and shapes complying with details indicated.
- 13. Rasp or sand flush entire surface of insulation to remove irregularities projecting more than 1/16 inch from surface of insulation and to remove yellowed areas due to sun exposure; do not create depressions deeper than 1/16 inch.
- 14. Interrupt insulation for expansion joints where indicated.
- 15. Install insulation closure blocks using ribbon-and-dab method to create air zones where indicated.
- 16. Form joints for sealant application with back-to-back casing beads for joints within EIFS and with perimeter casing beads at dissimilar adjoining surfaces. Make gaps between casing beads and between perimeter casing beads and adjoining surfaces of width indicated.
- 17. After installing insulation and before applying field-applied reinforcing mesh, fully wrap board edges. Cover edges of board and extend encapsulating mesh not less than 2-1/2 inches over front and back face, unless otherwise indicated on Drawings.

- 18. Treat exposed edges of insulation as follows:
  - a. Except for edges forming substrates of sealant joints, encapsulate with base coat, reinforcing mesh, and finish coat.
  - b. Encapsulate edges forming substrates of sealant joints within EIFS or between EIFS and other work with base coat and reinforcing mesh.
  - c. At edges trimmed by accessories, extend base coat, reinforcing mesh, and finish coat over face leg of accessories.
- 19. Coordinate installation of flashing and insulation to produce wall assembly that does not allow water to penetrate behind flashing and EIFS protective coating lamina.
- E. Expansion Joints: Install at locations indicated, where required by EIFS manufacturer, and as follows:
  - 1. Where expansion joints are indicated in substrates behind EIFS.
  - 2. Where EIFS adjoin dissimilar substrates, materials, and construction.
  - 3. Where panels abut one another.
- F. Base Coat: Apply to exposed surfaces of insulation in minimum thickness recommended in writing by EIFS manufacturer, but not less than 1/16-inch dry-coat thickness.
- Reinforcing Mesh: Embed type indicated below in wet base coat to produce wrinkle-free installation with mesh continuous at corners and overlapped not less than 2-1/2 inches or otherwise treated at joints to comply with ASTM C 1397 and EIFS manufacturer's written requirements. Do not lap reinforcing mesh within 8 inches of corners. Completely embed mesh, applying additional base-coat material if necessary, so reinforcing-mesh color and pattern are not visible.
  - 1. Intermediate-impact reinforcing mesh.

- H. Additional Reinforcing Mesh: Apply strip reinforcing mesh around openings extending 4 inches beyond perimeter. Apply additional 9-by-12-inch strip reinforcing mesh diagonally at corners of openings (re-entrant corners). Apply 8-inch- wide strip reinforcing mesh at both inside and outside corners unless base layer of mesh is lapped not less than 4 inches on each side of corners.
  - 1. Embed strip reinforcing mesh in base coat before applying first layer of reinforcing mesh.
- I. Double Base-Coat Application: Where indicated, apply second base coat in same manner and thickness as first application except without reinforcing mesh. Do not apply until first base coat has cured.
- J. Primer: Apply over dry base coat according to EIFS manufacturer's written instructions.
- K. Finish Coat: Apply over dry primer maintaining a wet edge at all times for uniform appearance, in thickness required by EIFS manufacturer to produce a uniform finish of color and texture matching approved sample and free of cold joints, shadow lines, and texture variations.
- L. Sealer Coat: Apply over dry finish coat, in number of coats and thickness required by EIFS manufacturer.

### 3.5 INSTALLATION OF JOINT SEALANTS

- A. Prepare joints and apply sealants, of type and at locations indicated, to comply with applicable requirements in Division 7 Section "Joint Sealants" and in EIMA's "EIMA Guide for Use of Sealants with Exterior Insulation and Finish Systems, Class PB."
  - 1. Clean surfaces to receive sealants to comply with indicated requirements and EIFS manufacturer's written instructions.
  - 2. Apply primer recommended in writing by sealant manufacturer for surfaces to be sealed.
  - 3. Install sealant backing to control depth and configuration of sealant joint and to prevent sealant from adhering to back of joint.

- 4. Apply masking tape to protect areas adjacent to sealant joints. Remove tape immediately after tooling joints, without disturbing joint seal.
- 5. Recess sealant sufficiently from surface of EIFS so an additional sealant application, including cylindrical sealant backing, can be installed without protruding beyond EIFS surface.
- 6. Apply joint sealants after base coat has cured but before applying finish coat.

## 3.6 CLEANING AND PROTECTION

- A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive EIFS coatings.
- B. Provide final protection and maintain conditions, in a manner acceptable to Installer and EIFS manufacturer, that ensure that EIFS are without damage or deterioration at time of Substantial Completion.

+ + END OF SECTION + +

## SECTION 07411

## METAL ROOF PANELS

#### PART 1 - GENERAL

## 1.1 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 Work Specified Elsewhere:
  - 1. Section 06100, Rough Carpentry.
  - 2. Section 07712, Gutters and Downspouts
  - 3. Section 07600, Flashing and Sheet Metal Trim.
  - 4. Section 07920, Caulking and Sealants.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Factory-formed and field-assembled, standing-seam metal roof panels.
  - 2. Metal soffit panels.(NOT USED)

#### 1.3 DEFINITIONS

- A. Metal Roof Panel Assembly: Metal roof panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight roofing system.
- B. Solar Flux: Direct and diffuse radiation from the sun received at ground level over the solar spectrum, expressed in watts per square meter.
- C. Solar Reflectance: Fraction of solar flux reflected by a surface, expressed as a percent or within the range of 0.00 and 1.00.

## 1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide metal roof panel assemblies that comply with performance requirements specified as determined by testing manufacturers' standard assemblies similar to those indicated for this Project, by a qualified testing and inspecting agency.
- B. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of roof area when tested according to ASTM E 283 at the following test-pressure difference:
  - 1. Test-Pressure Difference: Negative 1.57-lbf/sq. ft.
  - 2. Positive Preload Test-Pressure Difference: Greater than or equal to 15.0 lbf/sq. ft. and the greater of 75 percent of building live load or 50 percent of building design positive wind-pressure difference.
  - 3. Negative Preload Test-Pressure Difference: 50 percent of design wind-uplift-pressure difference.
- C. Water Penetration: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
  - 1. Test-Pressure Difference: 2.86-lbf/sq. ft.
  - 2. Positive Preload Test-Pressure Difference: Greater than or equal to 15.0 lbf/sq. ft. and the greater of 75 percent of building live load or 50 percent of building design positive wind-pressure difference.
  - 3. Negative Preload Test-Pressure Difference: 50 percent of design wind-uplift-pressure difference.
- D. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift resistance class indicated.
- E. Structural Performance: Provide metal roof panel assemblies capable of withstanding the effects of

gravity loads and the following loads and stresses within limits and under conditions indicated, based on testing according to [ASTM E 1592] [ASTM E 330]:

- 1. Wind Loads: Determine loads based on the following minimum design wind pressures:
  - a. Uniform. pressure as indicated on Drawings.
- 2. Snow Loads: Per code unless otherwise indicated on drawings.
- 3. Deflection Limits: Engineer metal roof panel assemblies to withstand design loads with vertical deflections no greater than 1/240 of the span.
- F. Seismic Performance: Provide metal roof panel assemblies capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."
- G. Thermal Movements: Provide metal roof panel assemblies that allow for therm.al movements resulting from. the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttimesky heat loss.
  - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- H. Solar Reflectance for Roofs with Slopes Steeper Than 2:12: Initial solar reflectance of not less than 0.25 when tested according to ASTM E 903, and maintained, under norm.al conditions, solar reflectance not less than 0.15 for 3 years after installation.

#### 1.5 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal roof panel and accessory.

- B. Shop Drawings: Show fabrication and installation layouts of metal roof panels; details of edge conditions, joints, panel profiles, corners, anchorages, trim, flashings, closures, and accessories; and special details. Distinguish between factory— and field—assembled work.
  - 1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:
    - a. Flashing and trim.
    - b. Gutters.
    - c. Downspouts.
    - d. Snow guards.
    - e. Roof Vents.
    - f. High-Temperature Underlayment.
  - 2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Coordination Drawings: Roof plans drawn to scale and coordinating penetrations and roof- mounted items. Show the following:
  - 1. Roof panels and attachments.
  - 2. Purlins and rafters.
  - 3. Roof-mounted items including roof hatches, roof vents, equipment supports, pipe supports and penetrations, lighting fixtures, snow guards, and items mounted on roof curbs.
  - 4. Ridge, gable, soffit and fascia details including methods of attachment.
- D. Field quality-control inspection reports.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for the following:

- Metal Roof Panels: Include reports for air infiltration, water penetration, thermal performance, fire-test-response characteristics, solar reflectance, and structural performance.
- 2. Insulation and Vapor Retarders: Include reports for thermal resistance, fire-test- response characteristics, water-vapor transmission, and water absorption.
- F. Maintenance Data: For metal roof panels to include in maintenance manuals.
- G. Warranties: Special warranties specified in this Section.

# 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
  - 1. Preparation of data for metal roof panels, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.
- C. Source Limitations: Obtain each type of metal roof panel through one source from a single manufacturer.
- D. Product Options: Drawings indicate size, profiles, and dimensional requirements of metal roof panels and are based on the specific system indicated. Refer to Division 1 Section 01630, Substitutions.
  - Do not modify intended aesthetic effects, as judged solely by Engineer, except with prior Engineer's approval. If modifications are proposed, submit comprehensive explanatory data to Engineer for review.

# 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, metal roof panels, and other manufactured items so as not to be damaged or deformed. Package metal roof panels for protection during transportation and handling.
- B. Unload, store, and erect metal roof panels m a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal roof panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof panels to ensure dryness. Do not store metal roof panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Protect strippable protective covering on metal roof panels from exposure to sunlight and high humidity, except to extent necessary for period of metal roof panel installation.
- E. Protect foam-plastic insulation as follows:
  - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
  - 2. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.
  - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## 1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal roof panels to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify locations of roof framing and roof opening dimensions by field measurements

before metal roof panel fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating metal roof panels without field measurements, or allow for field-trimming of panels. Coordinate roof construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

## 1.9 COORDINATION

- A. Coordinate installation of roof curbs, equipment supports, and roof penetrations.
- B. Coordinate metal panel roof assemblies with rain drainage work, flashing, trim, and construction of other adjoining work to provide a leakproof, secure, and noncorrosive installation.

# 1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal roof panel assemblies that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures, including rupturing, cracking, or puncturing.
    - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal roof panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

- 1. Finish Warranty Period: 30 years from date of Substantial Completion.
- C. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
  - 1. Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Products: Subject to compliance with requirements, products that maybe incorporated into the Work include, but are not limited to, the products specified.
  - 2. Basis-of-Design Product: The design for each metal roof panel specified is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

## 2.2 PANEL MATERIALS

- A. Basis-of-Design: PAC-CLAD High Snap-On Standing Seam Metal Roofing Panels, (non-pencil rib)
- B. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
  - 1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.

- 2. Surface: Smooth, flat finish.
- 3. Exposed Finishes: Apply the following coil coating, as specified or indicated on Drawings.
  - a. Plastisol: Epoxy primer and vinyl plastisol topcoat; with a dry film thickness of not less than 0.2 milfor primer and 3.8 mil for topcoat.
- 4. Concealed Finish: Apply pretreatment and manufacturer's standard white or light- colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

## C. Panel Sealants:

- 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- 2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal roof panels and remain weathertight; and as recommended in writing by metal roof panel manufacturer.

# 2.3 MISCELLANEOUS MATERIALS

- A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal roof panels by means of plastic caps or factory-applied coating.
  - 1. Fasteners for Roof Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with a stainless-steel cap or zinc-aluminum-alloy head and EPDM or neoprene sealing washer.

- 2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
- 3. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

# 2.4 STANDING-SEAM METAL ROOF PANELS

- A. General: Provide factory-formed metal roof panels designed to be field assembled by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
  - 1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
- B. Basis of Design: Vertical-Rib, Snap-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels, and snapping panels together.
  - 1. Available Manufacturers:
    - a. Petersen Aluminum Corporation
    - b. BHP Steel Building Products USA Inc.
    - c. Modern Metal Systems, Inc.
    - d. VICWEST; Div. of Jenisys Engineered Products.
    - e. Or Approved Equal.
  - Material: Zinc-coated (galvanized) steel sheet,
     gauge thick.
    - a. Exterior Finish: Kynar 500.
    - b. Color: To be selected by the Owner from Manufacturer's standard color palette.

- 3. Batten: Same material, finish, and color as roof panels.
- 4. Clips: Floating to accommodate thermal movement.
  - a. Material: 18 gauge thick, zinc-coated (galvanized) steel sheet.
- 5. Panel Coverage: 18 inches.
- 6. Panel Height: 1.75 inch.
- 7. Uplift Rating: UL 60.

#### 2.5 METAL SOFFIT PANELS

- A. General: Provide factory-formed metal soffit panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners and factory-applied sealant] in side laps. Include accessories required for weathertight installation.
- B. Metal Soffit Panels: Match profile and material of metal roof panels.
  - 1. Finish: Match finish and color of metal roof panels.
  - Sealant: Factory applied within interlocking joint.

## 2.6 ACCESSORIES

- A. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including trim, copings, fasciae, corner units, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels, unless otherwise indicated.
  - 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.
  - 2. Clips: Minimum 0.0625-inch- thick, stainless-steel panel clips designed to withstand negative-load requirements.

- 3. Cleats: Mechanically seamed cleats formed from minimum 0.0250-inch- thick, stainless-steel or nylon-coated aluminum sheet.
- 4. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
- 5. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inchthick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- B. Flashing and Trim: Formed from 0.0179-inch- thick, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal roof panels.
- C. Snow Guards: Prefabricated, noncorrosive units designed to be installed without penetrating metal roof panels, and complete with predrilled holes, clamps, or hooks for anchoring.
  - 1. Seam-Mounted, Stop-Type Snow Guards: Clear polycarbonate stops designed for attachment to vertical ribs of standing-seam metal roof panels with stainless-steel set screws style as indicate don the drawings.

## a. Available Products:

- 1) Alpine Snow Guards, Div. of Vermont Slate & Copper Services, Inc.; Model No. 30.
- 2) Berger Bros. Co.; AP Snow Guards.
- 3) Polar Blox; Standing Seam Snowguard.

4) Or Approved Equal.

#### 2.7 FABRICATION

- A. General: Fabricate and finish metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Where indicated, fabricate metal roof panel joints with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will minimize noise from movements within panel assembly.
- D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
  - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
  - 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
  - 3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
  - 4. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.

- 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
- 6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal roof panel manufacturer.
  - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal roof panel manufacturer for application but not less than thickness of metal being secured.

# 2.8 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 and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

#### PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of work.
  - 1. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness

tolerances required by metal roof panel manufacturer.

- B. Examine roughing-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of metal roof panels before metal roof panel installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.
- B. Substrate Board: Install substrate boards over roof deck on entire roof surface. Attach with substrate-board fasteners.
  - 1. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
  - 2. Comply with UL requirements for fire-rated construction.
- C. Install flashings and other sheet metal to comply with requirements specified in Division 7 Section 07600, Flashing and Sheet Metal Trim.
- D. Install fascia and copings to comply with requirements specified in Division 7 Section 07600, Flashing and Sheet Metal Trim.
- E. Miscellaneous Framing: Install subpurlins, eave angles, furring, and other miscellaneous roof panel support members and anchorage according to metal roof panel manufacturer's written recommendations.

#### 3.3 UNDERLAYMENT INSTALLATION

A. Provide a High Temperature Ice and Water Shield Sheet Underlayment designed for metal roofing panels, Alco

High Temp (HT)Underlayment, Grace Self Adhering Ice and Water Shield HT (or equal): Install polyethylene sheet on roof sheathing under metal roof panels. Use adhesive for anchorage to minimize use of mechanical fasteners under metal roof panels in shingle fashion to shed water, with lapped and taped joints of not less than 2 inches, and per manufacturers recommendations.

- B. Install flashings to cover underlayment to comply with requirements specified here and in Division 7 Section 07600, Flashing and Sheet Metal Trim.
- C. Apply slip sheet over insulation before installing metal roof panels.

# 3.4 METAL ROOF PANEL INSTALLATION, GENERAL

- A. General: Provide metal roof panels of full length from eave to ridge, unless otherwise indicated or restricted by shipping limitations. Anchor metal roof panels and other components of the Work securely in place, with provisions for thermal and structural movement.
  - 1. Field cutting of metal roof panels by torch is not permitted.
  - 2. Rigidly fasten eave end of metal roof panels and allow ridge end free movement due to thermal expansion and contraction. Predrill panels.
  - 3. Provide metal closures at peaks, rake edges, rake walls, and each side of ridge and hip caps.
  - 4. Flash and seal metal roof panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
  - 5. Locate and space fastenings in uniform vertical and horizontal alignment.
  - 6. Install ridge caps as metal roof panel work proceeds.
  - 7. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
  - 8. Lap metal flashing over metal roof panels to allow moisture to run over and off the material.

# B. Fasteners:

- Galvanized Roof Panels: Use galvanized-steel fasteners for surfaces exposed to the exterior and galvanized steel fasteners for surfaces exposed to the interior.
- C. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal roof panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal roof panel manufacturer.
  - 1. Seal metal roof panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal roof panel manufacturer.
  - Prepare joints and apply sealants to comply with requirements in Division 7 Section 07920, Caulking and Sealants.

# 3.5 THERMAL INSULATION INSTALLATION FOR FIELD-ASSEMBLED METAL ROOF PANELS

- A. Board Insulation: Extend insulation in thickness indicated to cover entire roof. Comply with installation requirements in Division 7 Section "Building Insulation."
  - 1. Erect insulation horizontally and hold in place with Z-shaped furring members spaced 24 inches o.c. Securely attach narrow flanges of furring members to roof deck with screws spaced 24 inches o.c.

## 3.6 FIELD-ASSEMBLED METAL ROOF PANEL INSTALLATION

- A. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended by manufacturer.
  - 1. Install clips to supports with self-tapping fasteners.

- 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
- 3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
- 4. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
- B. Metal Soffit Panels: Provide metal soffit panels full width of soffits. Install panels perpendicular to support framing.
  - 1. Flash and seal panels with weather closures where metal soffit panels meet walls and at perimeter of all openings.
- C. Fascia Panels: Align bottom of panels and fasten with blind rivets, bolts, or self-tapping screws. Flash and seal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

# 3.7 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.
  - Install components required for a complete metal roof panel assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
- 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 set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

- 1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
- 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- C. Stop-Type Snow Guards: Attach snow guards to metal roof panels with adhesive, sealant, or adhesive tape, as recommended by manufacturer. Do not use fasteners that will penetrate metal roof panels.
  - 1. Provide snow guards, at locations indicated on Drawings, spaced at maximum of 3 feet on center apart, beginning 2 feet up from gutter with each snow guard centered between panel ribs.
  - 2. For rail type snow guards, install at metal ribs per manufacturer's instructions.
- D. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

# 3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform inspections and prepare reports.
- B. Manufacturer's Field Service: Engage a factoryauthorized service representative to inspect completed metal roof panel installation, including accessories. Report results in writing.

- C. Remove and replace applications of metal roof panels where inspections indicate that they do not comply with specified requirements.
- D. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

# 3.9 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal roof panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

+ + END OF SECTION + +

## SECTION 07463

## VINYL TRIM AND SOFFIT

#### PART 1 - GENERAL

## 1.1 SUMMARY

- A. The General Contractor shall furnish all labor, materials, equipment and incidentals to provide wood composite products as shown and specified.
- B. Section includes:
  - 1. Vented Vinyl Soffit
  - 2. Vinyl Trim
- C. Related Work Specified Elsewhere
  - 1. Section 07712, Gutters and Downspouts
  - 2. Section 07920, Caulking and Sealants
  - 3. Section 09900, Painting.

## 1.2 REFERENCES

- A. ASTM D 638 Standard Test Method for Tensile Properties of Plastics.
- B. ASTM D 648 Standard Test Method for Deflection Temperature of Plastics Under Flexural Load.
- C. ASTM D 696 Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 Degrees C. and 30 Degrees C.
- D. ASTM D 1784 Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
- E. ASTM D 2843 Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics.
- F. ASTM D 3679 Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Siding.

- G. ASTM D 4477 Standard Specification for Rigid Unplasticized Poly(Vinyl Chloride) (PVC) Soffit.
- H. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- I. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Materials; 2000.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- B. Verification Samples: For each finish product specified, two samples, representing actual product and color.

# 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Installer shall be licensed, registered or otherwise acceptable to authorities having jurisdiction to install exterior building products.
- B. Installer Qualifications: Provide installer with not less than three years of experience with products specified.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
  - 1. Finish areas designated by Architect.
  - Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
  - 3. Refinish mock-up area as required to produce acceptable work.

4. Accepted mock-ups shall be comparison standard for remaining work.

# 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inspect the materials upon delivery to assure specified products have been received. Store products in a safe area, away from construction traffic. Store under cover and off the ground, protected from moisture.
- B. Store on a flat surface under cover, stacked no more than 12 boxes high. Do not store in location where temperatures may exceed 130 degrees F.

#### 1.6 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

## 1.7 WARRANTY

- A. Material Warranty: Provide manufacturer's standard warranty and as follows:
- B. Certainteed Glamour Soffit decorative panels and Trim (Triple 4" fully vented style) Provide manufacturer's standard lifetime limited warranty on siding products, transferable to new owners.
- C. Warranty: CertainTeed warrants to the original property owner/consumer that, when subject to normal and proper use, CertaTrim will be free from manufacturing defects for the minimum 20-year period from date of installation.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. CertainTeed Corporation, 20 Moores Road, Malverne, PA 19355., www. Certainteed.com Tel: 800-233-8990
- B. Or approved equal

## 2.2 TRIM AND SOFFIT

- A. Soffit General Requirements: Provide products made of extruded polyvinyl chloride as specified in this section and manufactured to comply with requirements of ASTM D 3679. Polyvinyl chloride products with the following characteristics:
  - 1. Value T4 soffit, center vented.
  - Design: Triple 4 inches (102 mm); center vented, matte finish.
  - 3. Width: 12 inches (305 mm) plus or minus .062 inch (1.57 mm).
  - 4. Length: 12 feet (3.66 m) plus or minus) .025 inch (6 mm).
  - 5. Average Thickness: 0.040 inch (1.0 mm).
  - 6. Exposure: 4 inches (102 mm) single nailing hem.
  - 7. Maximum Warp (per 2 panels): 0.250 inch (6 mm).
  - 8. Ventilation 1.95 sq. in per sq. ft.
  - 9. Color: As selected by Owner from manufacturer's standards.
- B. Vinyl Trim, Soffit and Components: Provide products made of extruded polyvinyl chloride as specified in this section and manufactured to comply with requirements of ASTM D 3679.
- C. Provide elongated nailing slots on nailing flanges to allow for movement.
- D. Factory-notch ends of horizontal panels to form overlapping joints.
- E. Provide products that meet weathering requirements of ASTM D 3679.
  - 1. PVC cell classification in accordance with ASTM D 1784: 13334.
  - 2. Coefficient of linear expansion in accordance with ASTM D 696: 0.000029 inch per inch per degree F.

- 3. Tensile strength when tested in accordance with ASTM D 638: Minimum 6,326 pounds per square inch.
- 4. Modulus of elasticity when tested in accordance with ASTM D 638: Minimum 360,000 pounds per square inch, average.
- 5. Izod impact, standard 1/8 inch bar when tested in accordance with ASTM D 256: 3.30 foot-pounds per inch, average.
- 6. Shore D Hardness: Minimum 82.
- 7. Specific Gravity: Minimum 1.39.
- 8. Deflection temperature when tested in accordance with ASTM D 648: 170 degrees F, 264 pounds per square inch.
- 9. Smoke density rating when tested in accordance with ASTM D 2843: 48 percent, average.
- 10. Horizontal flammability, when tested in accordance with ASTM D 635:
  - a. Burn distance: 20 mm.
  - b. Burn time: Less than 5 seconds.
  - c. Surface burning characteristics when tested in accordance with ASTM E 84: Flame spread less than 20, fuel contribution 0, smoke density 275.
  - d. Fire Resistance Siding: 1 hour, when tested in accordance with ASTM E 119, with siding applied over gypsum sheathing.
- 11. Flammability Siding: Comply with requirements of UBC Std 26-9.
- 12. Fasteners: Aluminum nails, alloy 5056 or 6110, having minimum tensile strength 63,000 pounds per square inch.

#### 2.3 SOFFIT ACCESSORIES

A. Accessories shall be consistent with the shape, size and properties as shown in the manufacturer's literature and

as required for complete installation. Color shall be matched or color coordinated to the siding according to PHA/IHA's specifications. Accessories shall be produced from the same compound materials and with comparable properties as the siding.

- 1. J-Channel: 3/4 inch (19 mm) by 12 feet, 6 inch (3.81 m) length, for vertical and eave applications.
- 2. F-Channel: 3/4 inch (19 mm) by 12 feet 6 inches (3.81 m) length.
- 3. Soffit H-Bar: 3/4 inch (19 mm) by 12 feet, 6 inches (3.81 m) length, for horizontal and eave applications.

## 2.4 VINYL FASCIA TRIM

- A. Fascia: PVC TRIM with wood grain finish. Length 12 foot 6 inches.
  - 1. Certatrim Trimboards size as indicated on Drawings
    - a. Finish: smooth/smooth
    - b. Color: white, unless otherwise indicated or selected by Owner from manufacturer's Standard Colors.

#### 2.5 FASTENERS

A. Provide galvanized or other corrosion-resistant nails as recommended by manufacturer of siding products.

## PART 3 - EXECUTION

## 3.1 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

## 3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Finish materials on all ends and sides and ends. Apply touch up coating on new cuts. Factory finishing is preferred.

# 3.3 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

++ END OF SECTION ++



## SECTION 07600

## FLASHING AND SHEET METAL TRIM

#### PART 1 - GENERAL

#### 1.1 DESCRIPTION

## A. Scope:

- 1. Contractor shall furnish all labor, materials, equipment and incidentals required to provide flashing and sheet metal work as shown and specified. The work also includes:
  - a. Providing openings in flashing to accommodate the work under this and other sections and building into the flashing all items such as sleeves, anchor bolts, inserts and all other items to be embedded in flashing for which placement is not specifically provided under other sections.
  - b. Providing openings in flashing to accommodate the work under other contracts and assisting other contractors in building into the flashing all items such as sleeves, anchor bolts, inserts and all other items required to be embedded in flashing under other contracts.
- 2. The extent of the flashing and sheet metal Work shall be as shown on the Drawings, and/or required.
- 3. The types of flashing required include the following:
  - a. Flashing and counter flashing at penetrations in roofing and ends of roofing.
  - b. Miscellaneous flashings at openings in masonry walls.
  - c. Stepped flashing as indicated on plans.

- B. Coordination: Review installation procedures under other Sections and coordinate the installation of items that must be installed with the flashing and sheet metal Work.
- C. Related Work Specified Elsewhere:
  - 1. Section 06100, Rough Carpentry.
  - 2. Section 07411, Metal Roof Panels.
  - 3. Section 07463, Vinyl Trim and Soffit.
  - 4. Section 07712, Gutters and Downspouts.
  - 5. Section 07920, Caulking and Sealants.

# 1.2 QUALITY ASSURANCE

- A. Installer Qualifications:
  - 1. The installer shall be skilled and experienced in the type of flashing and sheet metal Work required, and equipped to perform workmanship in accordance with recognized standards. Submit name and qualifications to Engineer.
- B. Design Criteria:
  - 1. Except as otherwise shown or specified, comply with the recommendations and instructions of the manufacturer of the flashing and sheet metal being installed.
  - 2. Flashing and sheet metal shall be permanently watertight, and not deteriorate in excess of manufacturer's published limitations.
- C. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
  - 1. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association, 4201 Lafayette Center Dr., Chantilly, VA 20151-1209, (703) 803-2980, www.smacna.org.

- 2. CDA: Copper Development Association Inc., 260 Madison Ave., New York, NY 10016, (212) 251-7200, www.copper.org
- 3. ASTM A 304, Stainless Steel Sheet.
- 4. ASTM B 29, Pig Lead.
- 5. ASTM B 32, Solder Metal.
- 6. FS O-F-506C, Flux, Soldering, Paste and Liquid.
- 7. FS SS-C-153, Cement, Bituminous, Plastic.

#### 1.3 SUBMITTALS

- A. Samples: Submit for approval 12-inch square samples of specified material to be exposed as flashing. Samples will be reviewed by Engineer for color and texture only. Compliance with other requirements is the exclusive responsibility of the Contractor.
- B. Shop Drawings: Submit for approval the following:
  - of 1. Copies Catalog Sheets, Specifications, manufacturer's specifications, installation instructions and general recommendations for flashing and sheet metal required. Include manufacturer's data substantiating the materials comply with the requirements.

# 1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery of Materials: Deliver flashing and sheet metal materials to job or fabrication shop in manufacturer's original, unopened containers and rolls with labels intact and legible.
- B. Storage of Materials:
  - 1. Store materials in an area protected from construction traffic.
  - 2. Store materials in same package in which they were shipped.

C. Handling of Materials: Protect flashing from dents, scratches, warps or bends.

## 1.5 JOB CONDITIONS

## A. Scheduling:

- 1. Do not proceed with the flashing Work until curb and substrate construction, cant strips, blocking, and other construction to receive the Work is completed.
- 2. Schedule the installation of flashing and sheet metal to coincide with the installation of waterproofing drains, piping, blocking, nailers, framing at openings, curbs, and other adjoining and substrate work.

## PART 2 - PRODUCTS

## 2.1 MATERIALS FOR FLASHING FABRICATION

- A. Plain Copper Sheet: Cold rolled copper, ASTM B 370.
- B. PVC Coated Metal: Membrane manufacturer's PVC coated metal.
- C. Stainless Steel Sheet: Dead soft fully annealed stainless steel sheet, ASTM A 666, Type 302/304, 2D dull finish.
- D. Galvanized Steel Sheet: Commercial quality hot dip galvanized steel sheet, ASTM A653 and ASTM A 526.
- E. Prefinished Galvanized Steel Sheet: Commercial quality, extra smooth, hot dip galvanized, mill phosphatized galvanized steel sheet, ASTM A653/526.
  - 1. Finish: Fluorocarbon coating (Polyvinylidene Fluoride, PVDF). Reverse side primed. Shipped with strippable protective tape.
- F. Aluminum Sheet: Standard mill finish aluminum sheet. ASTM B 209, 3003-H14 alloy.
- G. Prefinished Aluminum Sheet: ASTM B 209, 3003-H14 alloy.

1. Finish: Fluorocarbon coating (polyvinylidene Fluoride PVDF). Reverse side primed. Shipped with strippable protective tape.

## 2.2 FASTENERS

- A. Nails: "Stronghold" type large flat head roofing nail.
  - 1. For Copper: Hardened copper.
  - 2. For Stainless Steel: Stainless steel.
  - 3. For Aluminum: Hard aluminum alloy or stainless steel.
  - 4. For Galvanized: Galvanized.
- B. Screws, Bolts, and Other Fastening Accessories:
  - 1. For Copper: Copper or brass.
  - 2. For Stainless Steel: Stainless steel.
  - 3. For Aluminum: Hard aluminum alloy or stainless steel.
  - 4. For Galvanized: Stainless steel.
- C. Anchors: Provide one of the following types:
  - 1. Hammer driven anchors, consisting of a stainless steel drive pin and a plastic or corrosion resistant metal expansion shield inserted thru a stainless steel disc with an EPDM sealing washer.
  - 2. Self-tapping, corrosion resistant, concrete and masonry screw inserted thru a stainless steel disc with an EPDM sealing washer.

#### 2.3 MISCELLANEOUS MATERIALS

- A. Solder for Stainless Steel: ASTM B 32, 60 percent tin and 40 percent lead, used with acid-chlorine flux.
- B. Nails, Screws and Rivets: Stainless steel, or as recommended by manufacturer of flashing sheet.
- C. Cleats: Same metal and gage as sheet being anchored, 2 inches wide, punched for 2 anchors.

- D. Sealants: Refer to Section 07920, Caulking and Sealants.
- E. Reglets: Provide springlock type reglets with windlock clips as follows:
  - 1. Provide stainless steel, Type 304, 0.02-inches thick, for masonry, concrete and surface installation with top flange 4-inches wide to penetrate the first width of brick.
  - 2. Produce and Manufacturer: Provide one of the following:
    - a. Type SM, MA and CO as manufactured by Fry Reglet Corporation.
    - b. Concrete, Masonry and Surface Types as manufactured by Keystone Flashing Company.
    - c. Or equal.

## 2.2 FABRICATION

- A. Conform to quality, procedures and methods recommended by the Sheet Metal and Air Conditioning Contractors National Association, Incorporated, unless otherwise shown or specified.
- B. Fabricated Metal Flashing: Shop fabricate sheet metal items to comply with profiles and sizes shown, and to comply with manufacturer's recommended details. Except as otherwise shown or specified, provide soldered flatlock seams, and fold back metal to form a hem on the concealed side of exposed edges. Comply with metal producers' recommendations for tinning, soldering and cleaning flux from metal.
- C. Metal flashings, copings, counter flashings, crickets (roof saddle) etc. shall be formed of sheet metal as indicated on the Drawings (or as otherwise approved by the Architect).
- D. Make surfaces free of waves and buckles with lines, arises and angles sharp and true; curves shall be smooth.
- E. Materials furnished hereunder to be built into work by others shall be in condition for final installation. Do

all cutting, fitting, drilling or other operation in sheet metal required to accommodate work of other trades. Provide any items essential to complete the installation, though not specifically shown or specified, of the same kind, quality, and type as similar items utilized elsewhere in the building.

- F. Cap Flashing, where indicated on Drawings:
  - 1. Copper: 16 oz.
  - 2. Zinc-Tin Coated Copper: 16 oz.
  - 3. Stainless Steel: 26 ga (.018 inch).
  - 4. Galvanized Steel: 24 ga (.023 inch).
  - 5. Pre Finished Galvanized Steel: 24 ga (.023 inch).
- G. Cap Flashing With In-Wall or Thru-Wall Cap Receiver, where indicated on Drawings: Three way mortar bond type receiver with snap fit cap flashing; "Keystone Two-Piece Cap Flashing" by Keystone Flashing Co., 5119 N. Second Street, Philadelphia, PA 19120, (800) 526-8348, www.keystoneflashing.com.
  - 1. Copper: 16 oz.
  - 2. Zinc-Tin Coated Copper: 16 oz.
  - 3. Stainless Steel: 26 ga (.018 inch).
- H. Base Flashing, where indicated on the Drawings:
  - 1. Copper: 20 oz.
  - 2. Zinc-Tin Coated Copper: 20 oz.
  - 3. Stainless Steel: 24 ga (.025 inch).
  - 4. Aluminum: .032 inch.
  - 5. Prefinished Aluminum: .032 inch.
  - 6. Prefinished Galvanized Steel: 24 ga (.023 inch).
  - 7. Hypalon Coated Metal
  - 8. PVC Coated Metal

- I. Formed Gravel Stops:
  - 1. Copper: 20 oz.
  - 2. Zinc-Tin Coated Copper: 20 oz.
  - 3. Stainless Steel: 24 ga (.025 inch).
  - 4. Galvanized Steel: 24 ga (.023 inch).
  - 5. Prefinished Galvanized Steel: 24 ga (.023 inch).
  - 6. Aluminum: .040.
  - 7. Prefinished Aluminum: .040.
  - 8. Hypalon Coated Metal
  - 9. PVC Coated Metal
- J. Extruded Aluminum Gravel Stop and Fascia Sump where indicated on the Drawings: Complete system including fascia, water dam, splice plates, corners, and intersections, and all other accessory components by Viridian Systems, 30700 Solon Industrial Parkway, Solon, OH 44139; Metal ERA, 1600 Airport Rd., Waukesha, WI 53188, (800) 558-2162, www.metalera.com; or IMETCO (Innovative Metals Company, Inc.) 2070 Steel Dr., Tucker, GA 30084, (800) 646-3826, www.imetco.com.
  - 1. Face Height: Closest manufacturer's standard dimension to face height shown on Drawings.
  - 2. Style: Specifically Designed for:
    - a. Conventional Built-Up roofing Membrane.
    - b. Protected Built-Up Roofing Membrane.
    - c. One Ply Roofing Membrane.
    - d. Protected One Ply Roofing Membrane.
  - 3. Finish: Fluorocarbon Coating (Polyvinylidene Fluoride, PVDF)/Clear Anodized/ Color Anodized.
  - 4. Color: As selected by the Owner from manufacturer's standard colors.

- K. Extruded Aluminum Gravel Stop where indicated on the Drawings: Complete system including gravel stop, extruded aluminum joint cover plates, concealed .025 inch aluminum joint flashing, fasteners, corners, and intersections and all other accessory components. Type F gravel stop by Architectural Products Company, 1290 Aviation Blvd., Suite 200, P.O. Box 630, Hebron, KY, (800) 837-1001, www.archprod.com.
  - 1. Face Height: Closest manufacturer's standard dimension to face height shown on drawings.
  - 2. Finish: Fluorocarbon Coating (Polyvinylidene Fluoride, PVDF) / Clear Anodized/ Color Anodized.
  - 3. Color: As selected by the Owner from manufacturer's standard colors.
- L. Thru Wall Scupper, where indicated on the drawings:
  - 1. Copper: 20 oz.
  - 2. Zinc-Tin Coated Copper: 20 oz.
  - 3. Stainless Steel: 24 ga (.025 inch).
  - 4. Galvanized Steel: 24 ga (.023 inch).
  - 5. Prefinished Galvanized Steel: 24 ga (.023 inch).
  - 6. Hypalon Coated Metal: Membrane manufacturer's Hypalon coated metal.
  - 7. PVC Coated Metal: Membrane manufacturer's PVC coated metal.
- M. Shop Formed Coping, where indicated on the Drawings:
  - 1. Copper: 20 oz.
  - 2. Zinc-Tin Coated Copper: 20 oz.
  - 3. Stainless Steel: 24 ga (.025 inch).
  - 4. Galvanized Steel: 24 ga (.023 inch).
  - 5. Prefinished Galvanized Steel: 24 ga (.023 inch).

- 6. Aluminum: .040 inch.
- 7. Prefinished Aluminum: .040 inch.
- N. Factory Fabricated Formed Coping: Complete system including .063-inch aluminum coping, anchor plates, joint drainage system, concealed joint covers, corners, and intersections, and all other accessory components by Viridian Systems, 30700 Solon Industrial Parkway, Solon, OH 44139; Metal ERA, 1600 Airport Rd., Waukesha, WI 53188, (800) 558-2162, www.metalera.com; or IMETCO (Innovative Metals Company, Inc.) 2070 Steel Dr., Tucker, GA 30084, (800) 646-3826, www.imetco.com.
  - 1. Finish: Fluorocarbon Coating (Polyvinylidene Fluoride PVDF) / Clear Anodized / Color Anodized.
  - 2. Color: As selected by the Owner from manufacturer's standard colors, unless indicated on the Drawings.
- O. Metal Expansion Joint Cover:
  - 1. Copper: 20 oz.
  - 2. Zinc-Tin Coated Copper: 20 oz.
  - 3. Stainless Steel 24 ga (.025 inch).
  - 4. Aluminum: .040 inch.
  - 5. Galvanized Steel: 24 ga (.023 inch).
- P. Bellows Type Expansion Joint Cover: Factory fabricated unit with neoprene bellows backed with closed cell foam, anchored to metal flange. Include prefabricated corners, and intersections (if any), joint splice plater, and all other accessory components.
  - 1. Metal Flange, where indicated on the Drawings: Copper/Galvanized Steel/Aluminum.
- Q. Roof Drain Flashing: Sheet lead, 4 lbs per square.
- R. Flashing Pipe thru-Roof, where indicated on the Drawings:
  - 1. Copper: 16 oz.
  - 2. Zinc-Tin Coated Copper 16 oz.

- 3. Stainless Steel: 26 ga (.018 inch).
- S. Pitch Pockets, where indicated on the Drawings:
  - 1. Copper: 16 oz.
  - 2. Zinc-Tin Coated Copper: 16 oz.
  - 3. Stainless Steel: 26 ga (.018 inch).
- T. Eave and Rake Flashing, where indicated on the Drawings:
  - 1. Copper: 16 oz.
  - 2. Zinc-Tin Coated Copper: 16 oz.
  - 3. Galvanized Steel: 24 ga (.023 inch).
  - 4. Prefinished Galvanized Steel: 24 ga (.023 inch).
  - 5. Aluminum: .032 inch.
  - 6. Prefinished Aluminum: .032 inch.
- U. Valley Flashing, where indicated on the Drawings:
  - 1. Copper: 16 oz.
  - 2. Zinc-Tin Coated Copper: 16 oz.
  - 3. Aluminum: .032 inch.
  - 4. Prefinished aluminum: .032 inch.
  - 5. Prefinished Galvanized Steel: 24 ga (.023 inch).
- V. Crickets, where indicated on the Drawings:
  - 1. Copper: 20 oz.
  - 2. Zinc-Tin Coated Copper: 20 oz.
  - 3. Aluminum: .032 inch.
  - 4. Prefinished Aluminum: .032 inch.
  - 5. Prefinished Galvanized Steel: 24 ga (.023 inch).
- W. Snow Guards, where indicated on the Drawings: Zaleski Snow-Guards for Roofs, Inc., 11 Alden St., New Britain,

CT 06053, (860) 225-1614, www.snowguards.com. Designed specifically for installation on:

- 1. Slate Roof: Model No. 4 snow guard.
- 2. Asphalt Shingle Roof: Model No. 4 snow guard with hook tab removed and drilled for nailing.
- 3. Tile Roof: Model No. 6 snow guard.
- 4. Copper Roof: Model No. 7 snow guard.
  - a. Adhesive: Snow guard manufacturer's standard or recommended sealant adhesive or 2 sided tape to suit roofing material.
- X. Snow Flashing, where indicated on the Drawings:
  - 1. Copper: 16 oz.
  - 2. Zinc-Tin Coated Copper: 16 oz.
  - 3. Aluminum: .032 inch.
  - 4. Prefinished Aluminum: .032 inch.
- Y. Thru Wall Flashing for Masonry Construction, where indicated on the Drawings:
  - 1. Copper Fabric: 7 oz copper sheet with asphalt impregnated glass fabric bonded to both sides.
    - a. Joint Sealant: Trowel grade asphalt roofing cement.
- Z. Door and Window Flashing for Masonry Construction, where indicated on the Drawings:
  - 1. Copper Fabric: 7 oz copper sheet with asphalt impregnated glass fabric bonded to both sides.
    - a. Joint Sealant: Trowel grade asphalt roofing cement.
- AA. Door and Window Flashing for wood frame construction, where indicated on the Drawings:
  - 1. Copper: 10 oz.

- 2. Stainless Steel: 30 ga (.012 inch).
- 3. Aluminum: .032 inch.
- BB. Cleats, where indicated on the Drawings:
  - 1. Copper: 16 oz.
  - 2. Galvanized Steel: 24 ga (.023 inch).
  - 3. Aluminum: .040 inch.
- CC. Continuous Edge Strip, where indicated on the Drawings:
  - 1. Copper: 20 oz.
  - 2. Galvanized Steel: 24 ga (.023 inch).
  - 3. Aluminum: .040 inch.

## PART 3 - EXECUTION

## 3.1 INSPECTION

A. Contractor, their installer, and a representative of the roofing materials manufacturer shall examine the substrate and the conditions under which the flashing and sheet metal work is to be performed, and notify Engineer in writing of unsatisfactory conditions. Do not proceed with flashing and sheet metal work until unsatisfactory conditions have been corrected in a manner acceptable to Engineer.

## 3.2 PREPARATION

- A. Before installing flashing and sheet metal, verify shapes, and dimensions to be covered.
- B. Prepare substrates as recommended by the sheet metal manufacturer.
- C. Do not install the Work of this Section unless all necessary nailers, blocking and other supporting components have been provided.
- D. Do not install the Work of this Section unless all substrates are clean and dry.

## 3.3 INSTALLATION

#### A. General:

- Separate dissimilar metals from each other by painting each metal surface in the area of contact with a heavy application of bituminous coating, or by other permanent separation as recommended by the manufacturers of the dissimilar metals. Comply with the following:
  - Separate stainless steel from dissimilar a. metals, including regular steel and iron, and from cementitious materials by a course of roofing felt wherever possible. Where felt application is not possible, coat the stainless steel or other material with a 15-mil bituminous coating. Where felt is applied under sheets which will be soldered or welded, cover felt with a course of building paper before installing stainless steel. Comply with manufacturer's recommendations for other forms of protection of the stainless steel against corrosion.
- 2. Provide thermal expansion for running sheet metal, flashing, and other items exposed for more than 15 feet-0 inches continuous length. Maintain a watertight installation at expansion seams. Locate expansion seams as shown or, if not shown, at the following maximum spacings for each general flashing use:
  - a. Flashing and Sheet Metal: At 10 feet-0 inches intervals, and 2 feet-0 inches each side of corners and intersections.
- 3. Fabricate and install the work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, excessive waves and avoidable tool marks, considering the temper and reflectivity of the metal. Provide uniform, neat flat-locked seams with minimum exposure of solder, welds and sealant. Fold back the sheet metal to form a hem on the concealed side of exposed edges.

- 4. Conceal fasteners and expansion provisions wherever possible in exposed work, and locate so as to minimize the possibility of leakage. Cover and seal work as required for a watertight installation.
  - a. Provide cleat-type anchorages for metal flashings and sheet metal wherever practical, arrange to relieve stresses from building movement, and thermal expansion and contraction.
  - b. Join parts under concealed rivets or sheet metal screws where necessary for strength or stiffness. Place sheets together before drilling.
  - c. In general, space nails, rivets, or screws not more than eight inches apart. If nailing into concrete or masonry, use "Dryvins" and drilled holes.
- 5. On vertical surfaces lap 2-piece flashings members a minimum of 3 inches.
- 6. On sloping surfaces, for slopes of not less than 6 inches in 12 inches, lap unsealed flashings a minimum of 6 inches. For slopes less than 6 inches in 12 inches use soldered flat locked seams.
- 7. For embedment of metal flashing flanges in built-up roofing or composition flashing or stripping, extend flanges for a minimum of 4-inches embedment, and bed in roofing cement or other setting compound which is compatible with flashing, adjoining work and substrate.
- 8. Splice and Expansion Units: Use splice plates of same metal and gage as the base material.
- B. Installation of Stainless Steel Flashing and Trim:
  - 1. Tin the edges of plain stainless steel to be soldered, for a width of 1-1/2 inches, using solder for stainless steel and acid flux. Remove every

trace of acid flux residue from the metal promptly after tinning or soldering.

2. Provide welded joints. Provide upturned, 1/2-inch wide hooked flanges, and weld between adjoining sheets; lay seam flat.

## 3.4 ADJUSTMENT AND CLEANING

- A. Protect flashing and sheet metal until Final Acceptance of the Work.
- B. Do not permit workmen, or others, to step directly on flashing sheets in place, or to place or move equipment over flashing and sheet metal surfaces. Protect surfaces during installation of permanent covering work and adjoining work.
- C. Neutralize excess flux as work progresses with 5 percent to 10 percent washing soda solution and rinse thoroughly.
- D. Clean exposed surfaces of every substance which is visible or might cause corrosion or prevent uniform oxidation of the metal surfaces. Exercise extreme care to remove fluxes and ferrous metal particles, including welding splatter and grinding dust.

+ + END OF SECTION + +

## SECTION 07712

## GUTTERS AND DOWNSPOUTS

#### PART 1 - GENERAL

## 1.1 DESCRIPTION

A. Scope: Contractor shall furnish all labor, materials, equipment and incidentals required to provide gutters and downspouts as shown and specified.

## 1.2 RELATED WORK SPECIFIED ELSEWHERE:

- A. Section 07411, Metal Roof Panels.
- B. Section 07463, Vinyl Trim and Soffit.
- C. Section 07600, Sheet Metal Flashing and Trim.
- D. Section 07920, Caulking and Sealants.

## 1.3 SUBMITTALS

A. Shop Drawings: Submit for approval Catalog Sheets, Specifications, and installation instructions for each material specified.

# 1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Store materials in an area protected from construction traffic.
- B. Store materials in same package in which they were shipped.
- C. Handling of Materials: Protect flashing from dents, scratches, warps or bends.

# 1.5 JOB CONDITIONS

## A. Scheduling:

1. Do not proceed with the Work until other construction to receive the Work is completed.

## PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Prefinished Steel: Galvalume steel sheet, ASTM A 792, fabricated from "tension leveled" coil stock.
  - 1. Finish: Full strength 70 percent Kynar 500 Fluorocarbon Coating (polyvinyldene fluoride, PVF) applied by the coil coating process. Minimum dry film thickness 1.0 mil.

## 2. Components:

- a. Hung Gutter: 22 gage galvalume steel.
- b. Downspouts: 24 gage galvalume steel.
- c. Outlet Tube, Offsets, and Elbows: 26 gage galvalume steel.
- d. Gutter Hanger Brackets: 1/8 inch by one inch galvalume steel bar with Kynar finish.
- e. Gutter Braces: 1/4 inch by 1-1/2 inch galvalume steel bar with Kynar finish.
- f. Gutter Stiffener: 1/8 inch x 3/4 inch galvanized steel bar.
- g. Downspout Support Hanger: 26 gage galvalume steel.
- h. Wire Strainers: Copper wire type.

## 3. Fasteners:

- a. Screws, Bolts, and Other Fastening Accessories: galvanized steel.
- b. Rivets: Stainless steel, minimum diameter 3/16 inch.

## B. Sealant:

1. Silicone, one-part, low modulus.

- a. Butyl rubber, one part.
- C. Aluminum gutters (where applicable or as indicated on drawings)
  - 1. Gutters shall be K-style of size as indicated on the drawings with baked enamel finish (color to be selected by Owner) .032" thick material. Hangers shall be bar type and submitted for approval.
  - 2. Downspouts shall be of size as indicated on the drawings and manufactured of 0.027" thick aluminum, baked-on enamel finish to match gutters as indicated on the Drawings.
  - 3. Aluminum flashing shall be as shown on the drawings and be made from 0.032" thick aluminum. Color to be selected by Owner.

#### 2.2 FABRICATION

- A. Conform to quality, procedures and methods recommended by the Sheet Metal and Air Conditioning Contractors National Association, Incorporated, unless otherwise shown or specified.
- B. Fabricate gutters, downspouts, and fittings to the shape and profile indicated on the Drawings. When fabrication details are not indicated follow the applicable requirements of the Architectural Sheet Metal Manual of the Sheet Metal and Air Conditioning Contractors National Association, Inc.
  - 1. Form gutters and downspouts continuously, minimum 10 foot sections.
- C. Make surfaces free of waves and buckles with lines, arises and angles sharp and true; curves shall be smooth.
- D. Materials furnished hereunder to be built into work by others shall be in condition for final installation. Do all cutting, fitting, drilling or other operation in sheet metal required to accommodate work of other trades. Provide any items essential to complete the installation, though not specifically shown or specified, of the same

kind, quality, and type as similar items utilized elsewhere in the building.

#### 2.3 ACCESSORIES

- A. Splash Pad: Precast concrete, 3500 psi. Form splash pads with a sloped depressed center area. Approximate size, one foot wide x two feet long.
- B. Hinged Gutter Guards

### 1. Manufacturer:

- a. US Gutter systems Inc. 2474 Walnut St #118, Cary, NC 27518, 888-202-2711 or 919-341-8282.
- b. AKDQ Gutter Guards 6" x 36" hinged gutter guard section
- c. Or Approved Equal.

#### PART 3 - EXECUTION

## 3.1 INSPECTION

A. Contractor, the installer, and a representative of the roofing materials manufacturer shall examine the substrate and the conditions under which the work is to be performed, and notify Engineer in writing of unsatisfactory conditions. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Engineer.

# 3.2 PREPARATION

- A. Before installing flashing and sheet metal, verify shapes, and dimensions to be covered.
- B. Prepare substrates as recommended by the sheet metal manufacturer.
- C. Do not install the Work of this Section unless all necessary nailers, blocking and other supporting components have been provided.

## 3.3 INSTALLATION

A. Connection to Existing Construction: Tie the items of Work in with the existing work to obtain watertight installation. Match the existing installation as much as practicable, unless otherwise specified. Repair and dress adjacent existing components as required to make secure and neat connections with new items.

# B. Installation of Hung Gutters:

- 1. Install gutter hanger brackets 3 feet oc. Install the brackets so there will be a slight pitch in the gutter towards the downspouts.
- 2. Join and seal the gutter sections, end pieces, mitered corners, and outlet tubes.
- 3. Install expansion joints where indicated on the drawings. If not indicated, place the expansion joints at mid points between the downspouts at maximum intervals of 48 feet.
  - a. Form the expansion joints with end baffles conforming to the shape of the gutter. Join the baffles to the gutter section.
  - b. Install a cover plate over the baffle.
- 4. Install a continuous stiffener bar along the top front edge of the gutter. Fold the gutter around the stiffener bar so it is securely locked in place.
- 5. Install gutter braces 3 feet o.c., staggered from the gutter hanger brackets. Secure the braces to the stiffener bar and to the back vertical portion of the gutter with brass or copper bolts.
- 6. Secure the top back edge of the gutter to the gravel stop, eave flashing, or continuous cleat as indicated on the drawings.

# C. Installation of Downspouts:

- 1. Join the downspout sections with end joints that telescope at least 1-1/2 inches.
- 2. Install necessary offsets and elbows.

- 3. Secure downspout with hangers at top and bottom and  $5' \times 0''$  o.c. with a minimum of 2 hangers at each downspout section. Form hangers to keep downspouts 1 inch away from wall.
- 4. Fasten downspouts to hangers with sheet metal screws.
- 5. Secure hangers to masonry and concrete walls with machine bolts in lead shields and to wood walls with screws.
- 6. Discharge Elbows: Fasten leader shoes to downspouts with a minimum of 3 sheet metal screws.
- 7. Connection to Underground Drains: Fit the downspout neatly into the drain pipe or boot. Caulk the joint with lead wool and seal with sealant.
- D. Installation of Splash Pads: Install splash pads under discharge elbows unless otherwise indicated.
- E. Miscellaneous Materials: (where applicable)
  - 1. Solder for Stainless Steel: ASTM B 32, 60 percent tin and 40 percent lead, used with acid-chlorine flux.
  - 2. Nails, Screws and Rivets: Stainless steel, or as recommended by manufacturer of flashing sheet.
  - 3. Cleats: Same metal and gage as sheet being anchored, 2 inches wide, punched for 2 anchors.
  - 4. Sealants: Refer to Section 07920, Caulking and Sealants.
  - 5. Reglets: Provide springlock type reglets with windlock clips as follows:
    - a. Provide stainless steel, Type 304, 0.02-inches thick, for masonry, concrete and surface installation with top flange 4-inches wide to penetrate the first width of brick.

- b. Produce and Manufacturer: Provide one of the following:
  - 1) Type SM, MA and CO as manufactured by Fry Reglet Corporation.
  - 2) Concrete, Masonry and Surface Types as manufactured by Keystone Flashing Company.
  - 3) Or equal.

## 3.4 ADJUSTMENT AND CLEANING

- A. Protect work until Final Acceptance of the Work.
- B. Do not permit workmen, or others, to step directly on work in place, or to place or move equipment over surfaces. Protect surfaces during installation of permanent covering work and adjoining work.
- C. Clean exposed surfaces of every substance which is visible or might cause corrosion or prevent uniform oxidation of the metal surfaces. Exercise extreme care to remove fluxes and ferrous metal particles, including welding splatter and grinding dust.

+ + END OF SECTION + +



## SECTION 07840

## FIRESTOPPING PENETRATIONS

#### 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. Provide firestop systems consisting of a material, or combination of materials, installed to retain the integrity of fire-resistance-rated construction by maintaining an effective barrier against the spread of flame, smoke, and/or hot gases through penetrations, blank openings, construction joints, or at perimeter fire containment in or adjacent to fire-resistance-rated barriers in accordance with the requirements of the Life Safety Code for this project.
- B. Firestop systems shall be used in locations including, but not limited to, the following:
  - 1. Penetrations through fire-resistance-rated floor and roof assemblies requiring protected openings including both empty openings and openings that contain penetrations.
  - 2. Penetrations through fire-resistance-rated wall assemblies including both empty openings and openings that contain penetrations.
  - 3. Membrane penetrations in fire-resistance-rated wall assemblies where items penetrate one side of the barrier.
  - 4. Joints in fire-resistance-rated assemblies to allow independent movement.
  - 5. Perimeter Fire Barrier System between a rated floor/roof and an exterior wall assembly.

- 6. Joints, through penetrations and membrane penetrations in Smoke Barriers and Smoke Partitions.
- C. Related Sections include the following:
  - 1. Division 07 Thermal and Moisture Protection
  - 2. Division 09 Finishes
  - 3. Division 15 and 18 Sections specifying duct and piping penetrations.
  - 4. Division 16 Sections specifying cable and conduit penetrations.

## D. Reference

- 1. ASTM E 84 Test Method for Surface Burning Characteristics of Building Materials
- 2. ASTM E 814 Fire Tests of Through Penetration Firestops
- 3. ASTM E1966: Test Method for Resistance of Building Joint Systems.
- 4. ASTM E1399: Test Method for Cyclic Movement and Measuring Minimum and Maximum Joint Width.
- 5. ASTM E119: Methods of Fire Tests of Building Construction and Materials.
- 6. ASTM E 2174 Standard Practice for On-Site Inspection of Installed Fire Stops
- 7. ASTM E 2393 Standard Practice for On-Site Inspection of Installed Fire Stop Joint Systems
- 8. ASTM E 2307 Standard Test Method for Determining the Fire Endurance of Perimeter Fire Barrier Systems Using the Intermediate-Scale, Multi Story Test Apparatus
- 9. UL Qualified Firestop Contractor Program.
- 10. UL 263: Fire Tests of Building Construction and Materials.

- 11. UL 723: Surface Burning Characteristics of Building Materials.
- 12. UL 1479 Fire Tests of Through-Penetration Firestop Systems
- 13. UL 2079 Tests for Fire Resistance of Building Joint Systems

# 1.3 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through fire-resistance-rated constructions, including empty openings and openings containing penetrating items as well as membrane penetrations, provide firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. All requirements for firestop systems as found in NFPA 101 (Life Safety Code) shall be adhered to.
  - 1. Where NFPA 101 exempts penetrations from requiring firestopping, such as filling annular space around non-metallic penetrations with grout or mortar, the exemption shall apply and not be subject to the firestopping provisions found in this Specification Section.
- B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814 or UL 1479:
  - 1. F-Rated Systems: Provide penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
  - 2. T-Rated Systems: For penetrations through floors located outside wall cavities or fire-resistance-rated shaft enclosures, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings.
  - 3. L-Rated Through-Penetration Firestop Systems: Provide firestop systems with L ratings, in addition to F and T ratings, as determined per UL 1479, where indicated by Code.

- 4. W Rated Through-Penetration Firestop Systems: Provide firestop systems with W Water Resistance ratings, in addition to F, T and L ratings, as determined per UL 1479, where indicated on drawings.
- C. Perimeter Fire Barrier Systems: Provide interior perimeter joint systems with fire-resistance ratings indicated, as determined per ASTM E 2307, but not less than the fire-resistance rating of the floor construction.
- D. Fire-Resistive Joints: Provide joint systems with fire-resistance ratings indicated, as determined per UL 2079 (ASTM E1399 and E1966), but not less than the fire-resistance rating of the construction in which the joint occurs.
- E. For firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
  - 1. For piping penetrations of plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
  - 2. For floor penetrations with annular spaces exceeding 100 mm (4 in.) in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
  - 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- F. Firestop Materials for Specific Conditions
  - 1. Cabling for data and communication applications shall be sealed with re-enterable firestopping products. Devices must be capable of maintaining the fire resistance rating of the penetrated membrane at 0 percent to 100 percent visual fill of penetrants. Each device must be capable of retrofit applications. Firestopping devices shall allow for

cable moves, additions or changes without the need to remove or replace any firestop materials.

- a. Pillow/brick type materials are allowed for any data/communications firestop application.
- b. Mortar
- c. Fire Stopping silicone
- d. Or Approved Equal
- G. Firestopping products shall have flame spread ratings less than 25 and smoke developed ratings less than 450, as determined per ASTM E 84. Note: Firestop products installed in plenum spaces shall have a smoke developed rating less than 50.
- H. Engineering Judgment (EJ): Where there is no specific third party tested and classified firestop system available for an installed condition, the Contractor shall obtain from the firestopping material manufacturer an Engineering Judgment (EJ) to be submitted to the CM/Architect. Having Jurisdiction for approval prior to installation. The EJ shall follow International Firestop Council (IFC) guidelines.

#### 1.4 SUBMITTALS

The contractor shall provide the following:

- A. Manufacturer Product Data Sheet: For each type of product indicated.
- B. Shop Drawings: For each firestop system, show each type of construction condition penetrated, relationships to adjoining construction and type of penetrating item. Include firestop design designation, including the assembly number, of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.
  - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each firestop system configuration for construction and penetrating items.
  - 2. Where Project conditions require modification to a qualified testing and inspecting agency's

illustration for a particular firestop condition, submit illustration, with modifications marked, approved by firestop system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

- 3. State the specific locations where each firestop is proposed to be installed.
- C. Qualification data showing compliance with Quality Assurance article:
  - 1. For independent inspecting agency to be hired by the Contractor.
- D. Firestop Schedule: Submit schedule itemizing the following:
  - 1. Manufacturer's product reference numbers and/or drawing numbers.
  - 2. UL, Inchcape Testing Services, Factory Mutual Research Corp., or Omega Point Lab design number.
  - 3. Location of firestop material.
  - 4. Penetrating Item Description/Limits: Material, size, insulated or uninsulated, and combustibility.
  - 5. Maximum allowable annular space or maximum size opening.
  - 6. Wall type construction.
  - 7. Floor type construction.
  - 8. Hourly Fire resistance rating of wall or floor.
  - 9. F rating.
  - 10. T rating, if available.

# 1.5 QUALITY ASSURANCE

A. Independent Inspecting Agency: Same as Installer Qualifications above, except substitute "inspect" for "install".

- 1. International Accreditation Service's Accreditation Criteria 291 (IAS AC291) may be substituted for 1.5.A.1 above for Inspecting Agency.
- B. Installation Responsibility: Assign installation of all firestop systems and fire-resistive joint systems in Project to a single qualified installer. Meet the following requirements:
  - 1. Installation personnel shall be trained by the approved firestop manufacturer.
  - 2. The installation firm shall be experienced in installing firestop systems and fire resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance.
  - 3. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified tested and listed system requirements.
  - 4. Minimum of three (3) years experience and shown to have successfully completed not less than 5 comparable scale projects and provide references.
- C. Source Limitations: Obtain firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.
- D. Product Characteristics: Provide firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
  - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, FM, OPL, ITS or another agency performing testing and follow-up inspection services for firestop systems acceptable to the Engineer.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials for firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.
- C. All firestop materials shall be installed prior to expiration date.

#### 1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install firestop systems when ambient or substrate temperatures are outside limits permitted by firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate firestop systems per manufacturer's instructions or Safety Data Sheet.

## 1.8 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that firestop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate firestop systems.
- C. Do not paint or conceal firestop system installations until each installation has been approved by the NIH Division of the Fire Marshal.

#### PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

A. Systems listed by approved testing agencies, as identified in part 1 above, may be used, providing they conform

to the construction type, penetrant type, annular space requirements and fire rating involved in each separate instance.

- B. Single Source Limitations: Obtain firestop systems for all conditions from a single manufacturer.
- C. Materials from different firestop manufacturers shall not be installed in the same firestop system or opening.
- D. Firestopping material shall be asbestos and lead free and shall not incorporate nor require the use of hazardous solvents.
- E. Firestopping sealants must be flexible, allowing for normal movement.
- F. Firestopping materials shall not shrink upon drying as evidenced by cracking or pulling back from contact surfaces such that a void is created.
- G. Firestopping materials shall be moisture resistant, and may not dissolve in water after curing.
- H. Materials used shall be in accordance with the manufacturer's written installation instructions.
- I. Identify installed firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and provide a label material that will result in partial destruction of label if removal is attempted. Include the following information on labels:
  - 1. The words "Warning Firestop System Do Not Disturb. Notify Building Management of Any Damage."
  - 2. Contractor's name, address, and phone number.
  - 3. Firestop system designation of applicable testing and listing agency.

- 4. Date of installation.
- 5. Firestop system manufacturer's name.
- 6. Installer's name.
- 7. Inspector's name (if applicable)

# 2.2 FIRESTOPPING, GENERAL

- A. Systems listed by approved testing agencies, as identified in part 1 above, may be used, providing they conform to the construction type, penetrant type, annular space requirements and fire rating involved in each separate instance.
- B. Compatibility: Provide firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating penetration firestop systems, under conditions of service and application, as demonstrated by firestop system manufacturer based on testing and field experience.
- C. Accessories: Provide components for each firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:
  - 1. Permanent forming/damming/backing materials,
     including the following:
    - a. Slag-/rock-wool-fiber insulation.
    - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
    - c. Fire-rated form board.
    - d. Fillers for sealants.
  - 2. Temporary forming materials.
  - 3. Substrate primers.

- 4. Collars.
- 5. Steel sleeves.

#### 2.3 MATERIALS

- A. Where piping or ductwork penetrates a fire rated assembly as indicated in the Drawing Set including walls, floors, ceilings, close off spaces between sleeves and pipes or ducts and adjacent work with fire stopping insulation and fire stopping caulk seal. Provide close fitting metal collar or escutcheons covers at both sides of penetration.
- B. All penetrations thru non-fire and fire rated walls and assemblies shall be sealed with 3M-Fire Barrier Caulk # CP25WB and/or 3M-Fire Barrier # FS-195 plus wrap/strip or, an approved equal, meeting the requirements of ASTM-E-814 and ANSI/UL1479, as shown on the drawings.

## PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 MIXING

A. For those products requiring mixing before application, comply with firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

## 3.3 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing firestop systems to comply with firestop

system manufacturer's written instructions and with the following requirements:

- 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of firestop systems.
- 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestop systems. Remove loose particles remaining from cleaning operation.
- 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

## 3.4 PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Install penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
  - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

- C. Install fill materials for firestop systems by proven techniques to produce the following results:
  - 1. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

## 3.5 FIRESTOP JOINT SYSTEMS INSTALLATION

- A. General: Comply with the "System Performance Requirements" article in Part 1 and with the firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.
  - 1. Install joint forming materials to provide support of firestop materials during application and at the position required to produce the cross-sectional shapes and depths of installed firestop material relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.
- B. Install tested and listed, classified systems and non-tested engineering judgments, EFRRA's that result in firestop materials:
  - 1. Directly contacting and fully wetting joint substrates.
  - Completely filling recesses provided for each joint configuration,
  - 3. Providing uniform, cross-sectional shapes and depths relative to joint width that optimize movement capability and meet tested and listed system requirements.
- C. Tool non-sag firestop materials immediately after their application and prior to the time skinning or begins. Form smooth, uniform beads of configuration indicated or required to:
  - 1. Produce fire-resistance rating
  - 2. Eliminate air pockets
  - 3. Ensure contact and adhesion with sides of joint

## 3.6 PERIMETER FIRE BARRIER SYSTEM INSTALLATION

A. General: Comply with "System Performance Requirements" article in Part 1 and with the firestop manufacture's

- installation and drawings pertaining to products and applications indicated.
- B. Install metal framing, curtain wall insulation, mechanical attachments, safing materials and other firestop system components as applicable within the system design.

# 3.7 FIELD QUALITY CONTROL

- A. Contractor shall engage a qualified, independent inspecting agency to inspect firestopping. Independent inspecting agency shall comply with ASTM E 2174 or ASTM E 2393 requirements including those related to qualifications, conducting inspections, and preparing test reports.
- B. Enclose firestop systems with other construction only after inspection and acceptance by Engineer and independent inspecting agency. If the firestopping will remain exposed then it can be inspected as part of the final acceptance (pre-occupancy) inspection performed by the Independent inspecting agency.
  - 1. Inspection may include destructive demolition according to ASTM E 2174 or ASTM E 2393.
- C. Where deficiencies are found or a destructive demolition for inspection occurred, repair or replace firestop systems so they comply with requirements.

## 3.8 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by firestop system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestop systems immediately and install new materials to produce systems complying with specified requirements.

+ + END OF SECTION + +

## SECTION 07920

## CAULKING AND SEALANTS

#### PART 1 - GENERAL

#### 1.1 DESCRIPTION

## A. Scope:

- The General Contractor shall furnish all labor, materials, equipment and incidentals required to provide sealants and caulkings as specified.
- 2. The types of sealant and caulking Work required include the following:
  - a. All metal to metal joints.
  - b. All joints between masonry and metal.
  - c. All control joints
  - d. Control and expansion joints in cast-in-place concrete.
  - e. Control and expansion joints in unit masonry.
  - f. Control, expansion, and isolation joints in cast-in-place concrete slabs.
  - g. Joints between different materials listed above.
  - h. Perimeter joints of exterior openings where indicated.
  - i. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
  - j. Perimeter joints between interior wall surfaces and frames of interior doors, and windows.
  - k. Joints between plumbing fixtures and adjoining walls, floors, and counters.

1. All locations whether or not indicated on the Drawings required to render the building watertight.

#### B. Coordination:

- 1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with the sealants and caulkings.
- 2. Coordinate the final selection of sealants and caulkings to be compatible with all sealant and caulking substrates specified.

## 1.2 QUALITY ASSURANCE

A. Installer Qualifications: The applicator must have experience in this type of work and performed acceptable work on like projects of similar size.

## B. Job Mock-ups:

- 1. Prior to the installation of sealant and caulking Work, but after Engineer's approval of samples, install sample of each type of sealant and caulking in areas selected by the Engineer to show a representative installation of the sealants and caulkings. Obtain Engineer's acceptance of visual qualities of the mock-ups before start of sealant and caulking Work. Retain and protect mock-ups during construction as a standard for judging completed sealant and caulking Work. Do not alter mock-ups.
- 2. Sealant and caulking Work that does not meet the standard approved on the sample areas shall be removed and replaced with new material, as required by the Engineer.
- C. Source Quality Control: Obtain materials from only manufacturers who will, if required:
  - Send a qualified technical representative to the site, for the purpose of advising the installer of proper procedures and precautions for the use of the materials.

- 2. Test sealants and caulkings for compatibility with the substrates specified for conformance to ASTM C920, and recommend remedial procedures as required.
- D. Reference Standards: Comply with applicable provisions and recommendations, except as otherwise shown or specified.
  - 1. ASTM C 510, Standard Method for Staining and Color Change of Single or Multicomponent Joint Sealants.
  - 2. ASTM C 661, Standard Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.
  - 3. ASTM C 793, Standard Method for Effects of Laboratory Accelerated Weathering on Elastomeric Joint Sealants.
  - 4. ASTM C 794, Standard Method for Adhesion-in-Peel of Elastomeric Joints Sealants.
  - 5. ASTM C 920, Elastomeric Joint Sealants.
  - 6. ASTM C 1193, Standard Guide for Use of Joint Sealants.
- E. Compatibility: Before purchase of each specified sealant, investigate its compatibility with the joint surfaces, joint fillers and other materials in the joint system. Provide only materials (manufacturer's recommended variation of the specified materials) which are known to be fully compatible with the actual installation condition as shown by manufacturer's published data or certification.

# 1.3 SUBMITTALS

- A. Samples: Submit for approval the following:
  - 1. Sample of each size and type of sealant backer rod, 12-inches long, as recommended by the sealant and caulking manufacturer.
  - 2. Sample of bond breaker tape as recommended by the manufacturer.

- 3. Samples will be reviewed by Engineer for color and texture only. Compliance with other requirements is the exclusive responsibility of the Contractor.
- B. Manufacturer's Data: Submit for approval the following:
  - 1. Copies of manufacturer's specifications, recommendations and installation instructions for each type of sealant, caulking compound and associated miscellaneous material required. Include manufacturer's published data, indicating that each material complies with the requirements and is intended for the applications shown.
- C. Test Reports: Submit for approval the following:
  - Compatibility tests for substrates, based on adhesion-in-peel standard test procedures and ASTM C 920.
  - 2. Copies of certified laboratory test reports indicating conformance with the requirements specified.
- D. Guarantee: Submit for approval the following:
  - 1. Copies of written guarantee agreeing to repair or replace sealants which fail to perform as specified.

# 1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery of Materials:
  - 1. Deliver materials in sealant and caulking manufacturer's original unopened containers.
  - 2. Include the following information on the label:
    - a. Name of material and supplier.
    - b. Formula or specification number, lot number, color and date of manufactures.
    - c. Mixing instructions, shelf life and curing time when applicable.

3. Failure to comply with these requirements shall be sufficient cause for rejection of the material in question, by the Engineer, and their requiring its removal from the site. Supply new material conforming to the specified requirements at no additional cost to the Owner.

# B. Storage of Materials:

- 1. Store materials so as to preclude the inclusion of foreign materials.
- 2. Do not store or expose materials to temperature above 90°F or store in direct sunshine.
- 3. Do not use materials which are outdated as indicated by shelf life.
- 4. Store sealant tape in a manner which will not deform the tape.
- 5. In cool or cold weather store containers where temperature approximates 75°F for 16 hours before using.
- 6. When high temperatures prevail store mixed sealants in a cool place.

## C. Handling:

- 1. Handle materials carefully to prevent inclusion of foreign materials.
- Do not open containers or mix components until necessary preparatory work and priming has been completed.

## 1.5 JOB CONDITIONS

# A. Environmental Conditions:

- 1. Do not proceed with installation of sealants and caulkings under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation.
- 2. When joint substrates are wet.

- 3. Proceed with the Work only when forecasted weather conditions are favorable for proper cure and development of high early bond strength.
- 4. Wherever joint width is affected by ambient temperature variations, install elastomeric sealants only when temperatures are in the lower third of manufacturer's recommended installation temperature range, so that sealant will not be subjected to excessive elongation and bond stress at subsequent low temperatures.
- 5. When high temperatures prevail avoid mixing sealants in direct sunlight.
- B. Protection: Do not allow sealants and caulkings to overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces including rough textured materials. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces, by either the primer/sealer or the sealant and caulking materials.

## 1.6 GUARANTEE

A. Provide a written guarantee agreeing to repair or replace sealants which fail to perform as air-tight and watertight joints; or fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, or general durability; or appear to deteriorate in any other manner not clearly specified by submitted manufacturer's data, as an inherent quality of the material for the exposure indicated. Provide quarantee period of two years.

## PART 2 - PRODUCTS

## 2.1 MATERIALS

- A. Exterior and Interior vertical Joints:
  - 1. Two-Component Urethane Sealant:
    - a. Urethane-based, 2-part elastomeric chemical curing sealant complying with the following:

- 1) ASTM C 920: Type M, Grade NS, Class 50.
- 2) Adhesion-in-Peel, ASTM C 920 and ASTM C 794: Minimum 10 lbs/linear inch with no adhesion failure.
- 3) Hardness (Standard Conditions), ASTM C 661: 24-35 (Shore A).
- 4) Stain and color change, ASTM C 920 and ASTM C 510: No discoloration or stain.
- 5) Accelerated Aging, ASTM C 793: No change in sealant characteristics after 250 hours in weatherometer.
- 6) Rheological Vertical Displacement at 120°F, ASTM C 920: No sag.
- 7) Withstand repeated movement of up to 25 percent of joint width without failure.
- 8) Minimum elongation at ultimate break point (ASTM D 412): 500 percent.
- b. Product and Manufacturer: Provide one of the following:
  - 1) MasterSeal NP 2 by Master Builders Solutions.
  - 2) Dymeric by Tremco.
  - 3) THC-90 by Tremco
  - 4) Pecora Dynaflex
  - 5) Or approved equal.
- B. Exterior and Interior Horizontal Joints:
  - 1. Two-Component Polyurethane Sealant:
    - a. Polyurethane-based,: Two-part, self-leveling silicone or polyurethane sealant for traffic bearing construction complying with the following:

- 1) ASTM C 920: Type M, Grade NS, Class 50.
- 2) Water Immersion Bond, ASTM C 920: Elongation of 25% with no adhesive failure.
- 3) Hardness (Standard Conditions), ASTM C 661: 30-40.
- 4) Stain and Color Change, ASTM C 920 and ASTM C 510: No discoloration or stain.
- 5) Accelerated Aging, ASTM C 793: No change in sealant characteristics after 250 hours in weatherometer.
- b. Product and Manufacturer: Provide one of the following:
  - 1) MasterSeal SL 2 by Master Builders Solutions.
  - 2) 255 by Tremco.
  - 3) Chem Calk 550 (not SWRI) by Bostik
  - 4) Or approved equal.
- C. Interior Wet Areas, where applicable or indicate don the Drawings (bathrooms, Shower Rooms, Etc.)
  - 1. One-part, mildew resistant silicone sealant
    - a. Silicone Sealant: One-part, mildew resistant silicone sealant complying with the following:
      - 1) ASTM C 920: Type M, Grade NS, Class 50.
      - 2) Water Immersion Bond, ASTM C 920: Elongation of 25% with no adhesive failure.
      - 3) Hardness (Standard Conditions), ASTM C 661: 30-40.

- 4) Stain and Color Change, ASTM C 920 and ASTM C 510: No discoloration or stain.
- 5) Accelerated Aging, ASTM C 793: No change in sealant characteristics after 250 hours in weatherometer.
- b. Product and Manufacturer: Provide one of the following silicone sealants:
  - 1) Dow Corning 786
  - 2) Dow Corning Tub and Ceramic
  - 3) Pecora 898 Sanitary Silicone
  - 4) General Electric Sanitary SCS1700
  - 5) Bostik Silicone Rubber Bathroom Caulk.
- D. Pre-formed Sealant: Preformed paintable sealant strips of open cell, compressible urethane foam, saturated with non-drying, non-staining, and non-migrating butylene compound.
- E. Provide colors selected by Engineer from sealant and caulking manufacturer's standard color charts.

  Manufacturers supplying sealants other than those specified above must provide the same colors available from those specified.
- F. Miscellaneous Materials:
  - 1. Joint Cleaner: Provide the type of joint cleaning compound recommended by the sealant and caulking manufacturer, for the joint surfaces to be cleaned.
  - 2. Joint Primer and Sealer: Provide the type of joint primer and sealer recommended by the sealant and caulking manufacturer, for the joint surfaces to be primed or sealed.
  - 3. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by the caulking and sealant manufacturer, to be applied to sealant-contact surfaces where bond to the substrate or joint filler must be avoided for proper performance of sealant and caulking. Provide self-adhesive tape wherever applicable.

- Sealant Backer Rod: Compressible rod stock 4. polyethylene polyethylene foam, iacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable nonabsorptive material as recommended for compatibility with sealant and caulking by the sealant and caulking manufacturer. Provide size and shape of rod which will control the joint depth for sealant placement, break bond of sealant at bottom of joint, form optimum shape of sealant bead on back side, and provide a highly compressible backer to minimize the possibility of sealant extrusion when joint is compressed.
- 5. Low Temperature Catalyst: Provide the type recommended by the sealant and caulking manufacturer.

## 2.2 MIXING

- A. Comply with sealant manufacturer's written instructions for mixing 2-component sealants.
- B. Thoroughly mix components before use.
- C. Add entire contents of activator can to base containers. Do not mix partial units.
- D. Mix contents for a minimum of 5 minutes or as recommended by the sealant manufacturer, until color and consistency are uniform.

## 2.3 PREFORMED JOINT SEALANTS

- A. Preformed Silicone-Sealant System: Provide manufacturer's standard system consisting of precured low-modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates.
- B. Preformed Foam Sealants: Provide manufacturer's standard preformed, precompressed, impregnated, open-cell foam sealant manufactured from high-density urethane foam impregnated with a nondrying, water-repellent agent; factory produced in precompressed sizes and in roll or stick form to fit joint widths indicated and to develop a watertight and airtight seal when compressed to the degree specified by manufacturer; and complying with the following:

- 1. Properties: Permanently elastic, mildew resistant, nonmigratory, nonstaining, and compatible with joint substrates and other joint sealants.
- 2. Impregnating Agent: Manufacturer's standard.
- 3. Density: Manufacturer's standard.
- 4. Backing: Pressure-sensitive adhesive, factory applied to one side with protective wrapping.

### PART 3 - EXECUTION

#### 3.1 INSPECTION

A. Contractor must examine the joint surfaces, substrates, backing, and anchorage of units forming sealant rabbet, and the conditions under which the sealant and caulking Work is to be performed, and notify the Engineer in writing of any conditions detrimental to the proper and timely completion of the Work and performance of the sealants. Do not proceed with the sealant and caulking Work until unsatisfactory conditions have been corrected in a manner acceptable to the Engineer.

### 3.2 JOINT SURFACE PREPARATION

- A. Clean joint surfaces immediately before installation of sealant compound. Remove dirt, insecure coatings, moisture and other substances which would interfere with bonds of sealant compound as recommended by sealant manufacturer's written instructions.
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean,

sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:

- a. Concrete.
- b. Masonry.
- 3. Remove laitance and form-release agents from concrete.
- 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
  - a. Metal.
  - b. Glass.
- B. Etch concrete and masonry joint surfaces to remove excess alkalinity, unless sealant manufacturer's written instructions indicate that alkalinity does not interfere with sealant bond and performance.
  - 1. Etch with 5 percent solution of muriatic acid.
  - 2. Neutralize with dilute ammonia solution.
  - 3. Rinse thoroughly with water and allow to dry before sealant installation.
- C. If necessary, clean porous materials such as concrete and masonry by grinding, sand blasting or mechanical abrading. Blow out joints with oil-free compressed air, or by vacuuming joints prior to application of primer or sealant.
- D. Roughen joint surfaces on vitreous coated and similar non-porous materials, wherever sealant manufacturer's data indicates lower bond strength than for porous surfaces. Rub with fine abrasive cloth or wool to produce a dull sheen.

### 3.3 INSTALLATION

- A. Comply with sealant manufacturer's written instructions except where more stringent requirements are shown or specified and except where manufacturer's technical representative directs otherwise.
- B. Prime or seal the joint surfaces wherever recommended by the sealant manufacturer. Do not allow prime or sealer to spill or migrate onto adjoining surfaces. Allow primer to dry prior to application of sealants.
- C. Apply masking tape before installation of primer, in continuous strips in alignment with the joint edge to produce sharp, clean interface with adjoining materials. Remove tape immediately after joints have been sealed and tooled as directed.
- D. Do not install sealants without backer rods or bond breaker tape.
- E. Roll the back-up rod stock into the joint to avoid lengthwise stretching. Do not twist, braid, puncture or prime backer-rods.
  - 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.
- F. Employ only proven installation techniques, which will ensure that sealants will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of the joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.
- G. Install sealants to depths as recommended by the sealant manufacturer but within the following general limitations, measured at the center (thin) section of the bead.

- 1. For horizontal joints in sidewalks, pavements and similar locations sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to a depth equal to 75 percent of joint width, but not more than 5/8-inch deep or less than 3/8-inch deep.
- 2. For vertical joints subjected to normal movement and sealed with elastomeric sealants, but not subject to traffic, fill joints to a depth equal to 50 percent of joint width, but not more than 1/2-inch deep or less than 1/4-inch deep.
- 3. Install fire resistant sealants as recommended by sealant manufacturer to meet fire-rating requirements of the wall or floor.
- H. Remove excess and spillage of compounds promptly as the work progresses.
- I. Cure sealants and caulking compounds in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability.

## 3.4 FIELD QUALITY CONTROL

- A. Where questions of compatibility of sealants and substrate arise the contractor shall test the substrate in question for compatibility with the specified sealant and report their findings, with recommendations, to the Engineer. Any required sealant change shall be at no additional cost to the Owner.
- B. Do not proceed with installation of elastomeric sealants over joint surfaces which have been painted, lacquered, waterproofed or treated with water repellent or other treatment or coating unless a laboratory test for durability (adhesion), in compliance with ASTM C 920 has successfully demonstrated that sealant bond is not impaired by the coating or treatment. If laboratory test has not been performed, or shows bond interference, remove coating or treatment from joint surfaces before installing sealant.

- C. After nominal cure of exterior joint sealants which are exposed to the weather, test for water leaks. Flood the joint exposure with water directed from a 3/4-inch garden hose, without nozzle, held perpendicular to wall face, 2 feet-0 inch from joint and connected to a water system with 30 psi minimum normal water pressure. Move stream of water along joint at an approximate rate of 20 feet per minute.
- D. Test approximately 5 percent of total joint system, in locations which are typical of every joint condition, and which can be inspected easily for leakage on opposite face. Conduct test in the presence of the Engineer, who will determine the actual percentage of joints to be tested and the actual period of exposure to water from the hose, based upon the extent of observed leakage, or lack thereof.
- E. Where nature of observed leakage indicates the possibility of inadequate joint bond strength, Engineer may direct that additional testing be performed at a time when joints have been fully cured, followed by natural exposure through both extreme temperatures and returned to the lowest range of temperature in which it is feasible to conduct testing. Perform testing as directed at any time within 24 months of installation date.

# 3.5 ADJUSTMENT AND CLEANING

- A. Repair sealant installation at leaks or, if leakage is excessive, replace sealant installation as directed.
- B. Clean adjacent surfaces of sealant or soiling resulting from the Work. Use solvent or cleaning agent recommended by the sealant manufacturer. Leave all finish work in a neat clean condition.
- C. Protect the sealants during the construction period so that they will be without deterioration, soiling, or damage at the time of the Owner's acceptance.

#### 3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at

time of Functional Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

+ + END OF SECTION + +

# DIVISION 9 - FINISHES



### SECTION 09310

### CERAMIC TILE

### PART 1 - GENERAL

### 1.1 DESCRIPTION OF WORK

- A. Provide all ceramic tile work indicated on the Drawings and as specified herein, including, but not limited to: glazed ceramic tile, unglazed quarry tile, ceramic mosaic tile, porcelain tile, all trim units, setting and grouting materials, waterproofing membrane for thin-set applications, and marble saddles.
- B. Provide all drop lights for work force for the installation of the Ceramic Tile in rooms and spaces not having natural light.

#### 1.2 REFERENCES

- A. References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.
- B. Tile Manufacturing Standard: Comply with the requirements of ANSI "American National Standard Specifications for Ceramic Tile" (ANSI A137.1)
- C. Installation Standards: Comply with the requirements of ANSI "American Standard Specifications for the Installation of Ceramic Tile" (ANSI A108, A118 and A136), and correlating Tile Council of America (TCA) details except as shown or specified otherwise.
- D. Tile Council of America Handbook for Ceramic Tile Installation. This includes ANSI A108/A118/A136 "Standard Specifications or the Installation of Ceramic Time"

## 1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. The work included in this Section shall be coordinated with the work in the following other Sections:
  - Section 01342 Shop Drawings, Product Data and Samples

### 1.4 SUBMITTALS

### A. Product Data

Submit manufacturers' specifications and installation instructions for the following:

- 1. Each type of tile and trim unit specified.
- 2. Setting materials specified.
- 3. Grouting materials specified.
- 4. Waterproofing materials specified.
- 5. Sealer material specified.

## B. Shop Drawings

1. Where the Drawings indicate tile pattern or joint locations, or where more than one type or color of tile is indicated, submit Shop Drawings showing tile pattern, colors, and types, as well as locations and widths of control and expansion joints in tile surfaces.

### C. Samples

1. Initial Selection: Submit manufacturer's color charts consisting of actual tiles or sections of tile showing full range of colors, textures, and patterns available for each type of tile indicated. Include grout manufacturers standard range of colors for each grout type required.

## 2. Verification Samples:

a. Samples of each type of tile, color and pattern indicated, 12" x 12" sample with tile mounted on plywood or hardboard panels and grouted.

- b. 12" long sample of marble saddle, beveled and finished.
- c. Trim units: 2, each type, color and shape specified.
  - Tile manufacturer's standard range of colors and textures for each tile type required.
  - 2) Grout manufacturer's standard range of colors for each grout type required.
- 3. Field Samples: as specified.
- D. Quality Control Submittals
  - 1. Tile Grade Certificates: Furnish tile manufacturer's Master Grade Certificate bearing the manufacturer's certification for each shipment, type and composition of tile.
    - Before setting any tiles, furnish to the Engineer (for each shipment and type of tile) a certificate of grade, properly filled in on a Master Grade Certificate of the form approved in ANSI 137.1.
    - b. Certificate shall be signed by the manufacturer of the tiles and by the subcontractor for the Work, stating the grade, kind and full quantities of tiles; and give identification marks for all packages of tiles furnished under this Contract.
    - c. Brand packages with corresponding identification marks.
  - 2. Conductive Tile Certificates: Furnish certification that installed conductive tile areas have been tested and comply with ANSI A 108.7 and NFPA Standard 99.
  - 3. Installers' Qualification Data:
    - a. Name of each person who will be performing the work and their employer's name, business address, and telephone number.

- b. Names and addresses of 3 similar projects that each person has worked on during the past 5 years.
- 4. Affidavit certifying experience of the installation company, as specified.

## 5. Test Reports:

a. Provide certified copies of test reports on the performance of all materials and components furnished under this Section.

### 6. Certification:

- a. Submit Certification of Compliance of Specification on all items of work incorporated herein.
- 7. Material List:
  - a. Materials list of items proposed to be provided under this Section
- 8. Project Closeout Submittals
- 9. Maintenance Data: Tile and grout manufacturer's recommended cleaning and stain removal methods and materials.

# 1.5 REFERENCES, CODES, STANDARDS AND REGULATIONS

- A. Comply with the following reference standards as published by the American National Standards Institute (ANSI) and The Tile Council of America (TCA):
  - 1. ANSI A-108.1, Installation of Ceramic Tile with Portland Cement Mortar
  - 2. ANSI A-108.4, Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile Setting Epoxy Adhesive;
  - 3. ANSI A-108.5, Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex Portland Cement;

- 4. ANSI A-108.6, Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy;
- 5. ANSI A-108.7, Standard Specifications for Electrically Conductive Ceramic Tile Installed with Conductive Dry-Set Portland Cement Mortar;
- 6. ANSI A-108.8, Installation of Ceramic Tile with Chemical Resistant Furan Mortar and Grout;
- 7. ANSI A-108.9, Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout;
- 8. ANSI A-108.10, Installation of Grout in Tile Work;
- 9. ANSI A-118.1, Standard Specifications for Dry-Set Portland Cement Mortar;
- 10. ANSI A-118.2, Standard Specifications for Conductive Dry-Set Portland Cement Mortar;
- 11. ANSI A-118.3, Standard Specifications for Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive;
- 12. ANSI A-118.4, Standard Specifications for Latex-Portland Cement Mortar;
- 13. ANSI A-118.5, Standard Specifications for Chemical Resistant Furan Mortar and Grouts for Tile Installation:
- 14. ANSI A-118.6, Standard Specifications for Ceramic Tile Grouts;
- 15. ANSI A-118.8, Standard Specifications for Modified Epoxy Emulsion Mortar/Grout;
- 16. ANSI A-136.1, Standard for Organic Adhesives for Installation of Ceramic Tile; and
- 17. ANSI A-137.1, Standard Specifications for Ceramic Tile.

- B. Comply with the following reference standards as published by the American Society for Testing and Materials (ASTM):
  - 1. ASTM C373, Standard Method of Test for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Porous Whiteware Products;
  - 2. ASTM C424, Standard Method of Test for Crazing Resistance of Fired Glazed Whitewares by Autoclave Treatment;
  - 3. ASTM C482, Standard Method of Test for Bond Strength of Ceramic Tile to Portland Cement Mortar;
  - 4. ASTM C483, Standard Method of Test for Electrical Resistance of Conductive Ceramic Tile;
  - 5. ASTM C484, Standard Method of Test for Thermal Shock Resistance of Glazed Ceramic Tile;
  - 6. ASTM C485, Standard Method of Test for Measuring Warpage of Ceramic Tile;
  - 7. ASTM C499, Standard Method of Test for Determining Facial Dimensions and Thickness of Flat, Rectangular Wall and Floor Tile;
  - 8. ASTM C501, Standard Method of Test for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser;
  - 9. ASTM C502, Standard Method of Test for Wedging of Flat, Rectangular Wall and Floor Tile;
  - 10. ASTM C609, Standard Method of Measurement of Small Color Differences between Ceramic Wall or Floor Tile; and
  - 11. ASTM C648, Standard Method of Test for Breaking Strength of Ceramic Tile.

# 1.6 QUALITY ASSURANCE

A. Contractor shall provide a sufficient work force trained and skilled to perform the Work specified herein.

B. In procuring all items to be furnished as part of this Work, it is the Contractor's responsibility to verify the detailed requirements of the specifically named codes, standards and references and to verify that the items procured for use in this Work meet or exceed the specified requirements.

### C. Manufacturer

- 1. Furnish tile of the same manufacturer and from the same origin for each tile type and color.
- 2. Furnish setting and grouting materials of the same manufacturer and from the same origin for each tile type and method of installation, unless otherwise specified.

### 3. Manufacturer's Instructions:

- a. Submit manufacturer's specifications and other data needed to prove compliance with the specified requirements;
- b. Manufacturer's recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the Work.

## D. Qualifications

1. Installer is to be a firm that has a minimum of five years-experience with the installation of specified materials.

### E. Field Sample

Prior to proceeding with installation of tile, provide a field sample of each proposed tile installation. The field sample shall include both floor and wall applications of tile and, where applicable, shall also include a representative portion of any special color and joint pattern indicated.

The quantity and extent of such field sample(s) shall be coordinated with the Engineer. With the approval of the Engineer any acceptable field sample may be incorporated into the final Work.

## F. Test Reports:

Provide certified copies of test reports on the performance of all materials and components furnished under this Section.

### G. Certification:

Submit Certification of Compliance of Specification on all items of work incorporated herein.

#### H. Material List:

Materials list of items proposed to be provided under this Section.

## 1.7 DELIVERY, STORAGE, AND HANDLING

## A. Delivery and Storage

- 1. Deliver all materials of this Section to the job site in their original unopened containers with grade seals unbroken and labels intact and legible.
- 2. Store all materials under cover in a manner to prevent damage and contamination by water, freezing, foreign matter or other causes. Store only the specified materials at the job site in location designated by the Owner.

## B. Protection (General)

Use all means necessary to protect ceramic tile materials before, during, and after installation and to protect the Work and materials installed other trades.

## C. Replacements

In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

## 1.8 MAINTENANCE MATERIALS (EXTRA STOCK)

### A. General

Deliver extra stock of maintenance materials to the Owner. Furnish maintenance materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.

- 1. Tile: Furnish not less than one box for each 25 boxes or fraction thereof, for each type, color, pattern and size installed.
- 2. Wall Base: Furnish not less than 40 linear feet of each type, color, and size installed.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

#### A. General

- 1. Furnish tile by the same manufacturer and from the same origin for each tile type.
- 2. All tile indicated to be used on floor surfaces, as manufactured, shall bear a coefficient of friction not less than 0.60 when tested in accordance with ASTM C1028 under wet and dry conditions.

# B. Unglazed Porcelain Pavers

- 1. American Olean
- 2. Basis-of-Design: Daltile
- 3. Crossville Ceramics Co.
- 4. Casalgrande-Padana
- 5. Graniti Fiandre
- 6. Or approved equal.

## C. Unglazed Porcelain Mosaics

- 1. American Olean, Lansdale, PA
- 2. Basis-of-Design: Daltile, Dallas, TX
- 3. Vitra Tiles, Pelham Manor, NY
- 4. Or approved equal.

- D. Mortars, Adhesives and Grout
  - 1. Boiardi Products Corp. , Little Falls, New Jersey 07424.
  - 2. Bostik, Middleton, Massachusetts 01949.
  - 3. Dal-Tile Corporation, Dallas, Texas 75217.
  - 4. Laticrete International, Inc., Bethany, Connecticut 06524-3498.
  - 5. Tee an H.B. Fuller Co., Palatine, Illinois 60067.
  - 6. Mapei, Deerfield Beach, FL
- E. Cold Applied Liquid Waterproof Membrane (where applicable and indicated on dwgs)
  - 1. Laticrete International, Inc., Bethany, Connecticut 06524-3498.
  - 2. Mapei, Deerfield Beach, FL
- F. Water-Soluble Grout Release
  - 1. Aquamix
  - 2. Miracle Sealants Co.
- G. Sealer
  - 1. Miracle Sealants Co.

## 2.2 MATERIALS (WHERE APPLICABLE AND INDICATED ON DRAWINGS)

- A. Basis-of-Design Porcelain Product:
  - 1. Daltile: Stone Attaché collection
    - a. Haut Monde
    - b. Size: 2x2 mosaic
    - c. Thickness: 3/8"
    - d. Finish: Matte

- e. Color: Color selected based on interior floor finish.
- f. Mesh mounted, installed in modular pattern.
- g. Water absorption: < 0.5%.

### B. Tile Products

- 1. Unglazed Ceramic Mosaic Tile complying with Section 5.1 ANSI A137.1; Standard Grade.
  - a. Standard sizes: As specified in Contract Drawings.
  - b. Colors: shall be selected by Owner from clear and/or textured porcelain tile.
  - c. Factory mounted.
  - d. Edges: Smooth, all-purpose edge.
  - e. Average absorption: not to exceed 1/2 of 1%.
- 2. Unglazed porcelain paver tiles complying with Section 5.3 ANSI A137.1; Standard Grade.
  - a. Thickness: 5/16" min.
  - b. Colors: shall be selected by Owner.
  - c. If necessary to prevent soiling of exposed surfaces with setting and grouting materials, precoat with temporary protective coating.
- 3. Trim Furnish necessary trim shapes of same material, grade, type, and finish as flat tile unless otherwise indicated. Furnish trim for head, jambs and sills of openings, cap, bullnose, cove, external & internal corners to match characteristics of adjoining flat tile in size and color.
  - a. Cove Base: 6" x 6", 4" with 3/4 inch to 1 inch maximum radius sanitary cove unless otherwise indicated.

b. Shapes: Provide manufacturers standard special shapes to suit installation. Provide bullnosed units at external corners and wainscot. Provide square corners at internal corners.

### C. Marble Saddles

1. General: Provide marble which is uniform in color and finish, fabricated to sizes and profiles indicated or required to provide transition between tile surfaces and adjoining finished floor surfaces.

Saddles shall be accessible for the disabled and conform to the requirements of the N.Y.S. Building Code and the Americans with Disabilities Act.

### 2. Marble:

- a. Provide marble complying with MIA Group "A" requirements for soundness.
- b. Minimum abrasion hardness (Ha) of 10.0 when tested in accordance with ASTM C241.
- c. Marble saddles shall be low absorption, Grade "A" flush style, full door jamb width by full width of opening, notched for door stops, corners rounded. All exposed surfaces to have a honed finish.
- 3. Fabricate thresholds to equal width of door jambs, with true planes, edges straight, and free of chipped or broken arises and corners.
  - a. Raised Thresholds: Depth shall be as required to finish 1/2 inch above finished tile floor and have a minimum thickness of 1-1/4 inches, unless otherwise shown. Bevel exposed edge arises 1/4 by 1/4 inch.
  - b. Thresholds shall comply with ADA NYS code if entry to ADA accessible bathroom or room.
  - c. Flush Thresholds: 7/8 inch thick, unless otherwise shown.

- d. Finish: Honed finish on exposed faces and edges.
- D. Setting Materials
  - 1. Portland Cement Mortar: Complying with ANSI A108.1
    - a. Portland Cement ASTM C150 Type 1
    - b. Sand ASTM C144
    - c. Hydrated Lime ASTM C206 or ASTM C207 Type S
    - d. Water Clean and potable.
    - e. Reinforcement:
      - 1) Walls: 2.5 pound flat expanded metal lath.
        - a) Interior Work: ASTM C 847, except steel need not be copper-bearing and may have a paint finish.
        - b) Exterior Work: ASTM C 847, galvanized, copper-bearing steel.
      - 2) Floors: Wire fabric; 2 by 2 inch, 16/16 gage, galvanized welded steel wire mesh unless otherwise shown.
    - f. Follow recommendations outlined in TCA Handbook for Ceramic Tile Installation for mortar mix proportions.
  - 2. Latex Portland Cement Mortar: Thin-setting bed complying with ANSI A118.4.
    - a. Prepackaged dry set mix mortar incorporating dry polymer additive in the form of a reemulsifiable powder to which only water is added at job site, or latex additive, serving as a replacement for part or all of gauging water, added at job site to dry mortar mix. Comply with mixing directions of latex additive manufacturer and mortar manufacturer.

- 1) Mapei: Ultraflex
- 2) Laticrete: No. 253
- b. Dryset mortar with latex additive serving as replacement for all of gauging water, added at jobsite to dryset mortar mix. Use with porcelain paver tile installations.
  - 1) Mapei Kerabond premium floor and wall thinset mortar with Mapei Keralastic universal flexible additive.
  - 2) Laticrete No. 272 premium floor and wall thinset mortar with Laticrete No. 333 super flexible additive.
- E. Follow recommendations outlined in TCA Handbook for Ceramic Tile Installation.
- F. Grouting Materials
  - 1. Basis-of-Design Haut Monde product:
    - a. 1/8" joint size, as per manufacturer's recommendations.
  - 2. Polymer modified tile grout: a factory prepared compound of Portland cement, dry polymers and special additives complying with ANSI A 118.7
    - a. Laticrete 1500 Sanded, for joints 1/8" or greater.
    - b. Laticrete 1600 Unsanded, for joints less than 1/8".
    - c. Mapei Keracolor s (Ker 200), for joints 1/8" or greater.
    - d. Mapei Keracolor U ( Ker 800), for joints less than 1/8"
  - 3. Epoxy Grout: Solvent free, non-allergenic, two-component, 100% solids epoxy that is water cleanable, non-sagging, chemical and stain resistant, with long term color retention. Comply with ANSI 118.3.

- a. Laticrete SP 100
- b. Mapei Kerapoxy
- 4. Colors: Unless otherwise indicated, wall type grout shall be white and floor type grout shall be grey.
- G. Cold Applied Liquid Waterproof Membrane (for thinset floor applications):

Waterproof membrane shall be resistant to urine, dilute acids, alkalis, food wastes, and brine.

Materials shall be non-hazardous and meet all volatile content (V.O.C) requirements. Comply with ANSI Al18.10.

- 1. Laticrete 9235; Waterproof Membrane, cold applied liquid rubber and reinforcing fabric.
- 2. Mapei Mapelastic "L" (PRP M19); Cold, roller applied synthetic liquid rubber and fiber reinforcing fabric.

## H. Miscellaneous Materials

- 1. Metal Edge Strips: White zinc-alloy terrazzo strips, 1/8 inch wide at top edge with integral provision for anchorage to mortar bed or substrate, unless otherwise indicated.
- 2. Expansion Joint Materials:

### a. Sealants:

- 1) Traffic Areas: Polyurethane sealant with a Shore A hardness greater than 35; Federal Specification TT-S-00227 or TT-S-00230, Type I.
- 2) Interior Wet Surfaces and Exterior Vertical Surfaces: Silicone sealant; Federal Specification TT-S-001543, Class A or TT-S-00230, Type I or Type II (Class A) as applicable.
- 3) Other Surfaces: Polysulfide or polyurethane sealant; Federal

Specification TT-S-00227 or TT-S-00230, Type I or Type II (Class A) as applicable.

- b. Back-up Strip: Non-staining, flexible and compressible type of closed cell foam polyethylene or butyl rubber compatible with sealants used.
- 3. Tile Cleaner: Product acceptable to tile and grout manufacturers and as recommended by Ceramic Tile Institute.
- 4. Sealer: Miracle Sealants Company "511 Porous Plus", subject to approval of quarry tile and grout manufacturers. Penetrating sealer, causing no reduction of tile's slip resistance, and no change in tile appearance.

### 2.3 MIXES

A. Mix mortars, grouts, and additives to comply with referenced standards and manufacturers recommendations. Accurately proportion materials for mixing to produce mortars and grouts of uniform quality with optimum performance characteristics.

#### PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Surfaces to receive tile shall be clean, firm and smooth.
- B. Inspect all surfaces prepared by others before starting tile work and report all unsatisfactory conditions to the Engineer. Verify that wall surfaces are level, plumb and square and that floor slopes to drains. Starting tile work shall be considered acceptance of Work of others and existing substrate.
- C. Before proceeding with any tile work, verify:
  - Prior to application of thick set tile flooring systems, that sheet membrane waterproofing has been installed over prepared substrate and tested for leakage.

- 2. That plumbing contractor has installed all sleeves, drains, flashings and piping and that all piping systems have been run and tested for leakage.
- D. No installation of ceramic tile shall proceed until the field samples have been approved by the Engineer.

### 3.2 PROJECT CONDITIONS

- A. Maintain environmental conditions and protect Work during and after installation to comply with referenced standards and manufacturer's printed recommendations.
- B. Vent temporary heaters to exterior to prevent injury to persons or damage to tile work from carbon dioxide or carbon monoxide buildup.
- C. Maintain temperatures at not less than 50oF. (10oC) in tiled areas during installation and for 7 days after completion, unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

### 3.3 PREPARATION

- A. Prepare floors, walls and base substrates for tile installation in accordance with Tile Council of America's and product manufacturer's recommendations and requirements for wall and floor systems specified.
- B. Prior to application of thin set floor tile, install cold applied liquid rubber waterproof membrane as per manufacturer's recommendations and specifications as part of Work of this Section.
- C. Prior to application of thin set wall tile at locations having sheet membrane waterproofing turned up at wall base, such as in kitchen areas, provide materials to prepare the substrate for proper bonding as recommended by the thinset mortar manufacturer.
- D. Provide concrete substrates for tile floors installed with dry-set or latex-portland cement mortars that comply with flatness tolerances specified in referenced ANSI A 108 series of tile installation standards for installations indicated.

- 1. Use trowelable leveling and patching compounds per tile-setting material manufacturer's written instructions to fill cracks, holes, and depressions.
- 2. Remove protrusions, bumps, and ridges by sanding or grinding.
- E. Protection: Protect adjacent surfaces before tilework begins.
- F. Cleaning: Clean substrate surfaces in accordance with applicable reference standards and manufacturer's installation instructions.

### 3.4 INSTALLATION, GENERAL

A. ANSI Tile Installation Standard

Comply with applicable parts of ANSI 108.1 through 108.7 of tile installation standards included under American National Standard Specifications for Installation of Ceramic Tile.

- 1. Neutralize and seal substrate as required by the mortar/adhesive manufacturer's instructions.
- 2. Mix and apply proprietary setting and grouting materials in compliance with the manufacturer's instructions.
- B. TCA Installation Guidelines

Comply with Tile Council of America installation methods specified.

- C. All wall tile shall be laid up with vertical joints not over 1/16" thick, continuous and unbroken in perfect alignment. For tile mounted in sheets, make joints between tile sheets same width as joints within sheets so extent of each sheet is not apparent in finish Work.
- D. Tile shall be set to the required levels and planes with true lines and angles. Layout tile work and center tile fields in both directions in each space and on each wall area unless otherwise indicated on Drawings. Adjust to minimize tile cutting.

- E. Cut edges of tile shall be carefully ground and jointed. Do all cutting and drilling required for setting and as may be required by other contractors in a neat manner without marring the surface. Fit tile closely to electrical outlets, piping, fixtures and other penetrations so that plates, collars, or covers overlap tile.
- F. The tile setter shall cut holes in the base tile of toilet rooms where bronze tubing extends through the partitions into the adjoining pipe spaces.
- G. Set rings for floor type water closets, as specified in Division 15 of this Specification.
- H. Provide tile base at convector enclosures where indicated on Drawings. Tile base and wainscot shall be terminated with bullnose units at top course unless otherwise shown.
- I. Start all wainscots and facings above a ceramic glazed tile base 6 inch  $\times$  6 inch with 3/4 inch minimum or 1 inch maximum radius sanitary cove except where other flooring or base are indicated.
- J. All trim including cap, bullnose, cove, external and internal corners to match field tile in size and color unless indicated otherwise.
- K. Eliminate all voids behind tiles.
- L. Provide expansion joints as indicated, where tilework abuts restraining surfaces, where expansion or control joints occur in the substrate, and where recommended in the TCA Handbook method EJ171. Spacing of expansion joints shall not exceed 30 feet in each direction, and shall not exceed 12 feet where tile will be exposed to direct sunlight or moisture.

## 3.5 FLOOR TILE INSTALLATION METHODS

A. Ceramic Mosaic Tile, Porcelain Paver Tile, and Quarry Tile.

Install tile to comply with requirements indicated below for setting methods, TCA installation methods related to types of subfloor construction, and grout types:

- 1. Thick set method, reinforced, on interior concrete subfloors, including Kitchen areas: mortar bed of 1 1/4" to 2" thick, comply with TCA F121.
  - a. Commercial Portland Cement Mortar Bed: ANSI A108.1
  - b. Grout: Commercial Sanded Portland Cement type grout acid resistant, ANSI A118.6. At Kitchen areas provide epoxy grout, ANSI A118.3.
  - c. Expansion joints mandatory. Provide in accordance with TCA Method EJ171.
  - d. Mortar bed to be uniform depth within range specified above. Slope to be in fill installed as part of work of Section 03300 - Cast-in-Place Concrete.
- 2. Thin set method, interior concrete subfloors, except lobbies and corridors: mortar bed of 3/32" to 1/8", comply with TCA F122.
  - a. Latex Portland Cement Mortar Bed: ANSI Al18.4
  - b. Grout: Polymer modified Portland cement tile grout, ANSI A118.7. At Science Laboratory areas provide epoxy grout, ANSI A118.3.
  - c. Waterproof membrane: Cold applied liquid rubber provided as part of Work of this Section. Prepare slab and install membrane as per membrane manufacturer's recommendations and specifications. Turn membrane up onto wall, extending 2 inches above finished floor, as recommended by membrane manufacturer. Waterproof penetrations and around drains as recommended by the membrane manufacturer.
  - d. Expansion joints: follow waterproof membrane manufacturer's directions and recommendations. Provide in accordance with TCA Method EJ171.
- 3. Thin set method, interior concrete subfloors, for lobbies and corridors: mortar bed of 3/32" to 1/8", comply with TCA F113.

- a. Latex Portland Cement Mortar Bed: ANSI Al18.4
  - 1) For installation of porcelain paver tiles provide latex additive serving as replacement for all of gauging water, added at jobsite to dryset mortar mix. Premium thinset mortar, and flexible additive.
- b. Grout: Polymer modified Portland cement tile grout, ANSI A118.7.
- c. Provide expansion joints in accordance with TCA Method EJ171. Above grade provide joints spaced 8' to 12' apart in each direction.

## 4. Setting Beds

- a. Organic Adhesives:
  - 1) Use thin set organic adhesive method for installing tile on the following surfaces:
    - a) On Gypsum Wallboard installation shall conform to ANSI A108.4.

## b. Dry Set Mortar:

- 1) Use dry set mortar method for installing
   tile on the following surfaces:
  - a) Dimensionally stable concrete conform to ANSI A108.5.

### c. Tile Set With Adhesive

- 1) Surfaces must be straight and level and in proper condition to receive tile.
- 2) Spread adhesive with 1/16" "V" notched trowel, leaving no large deposits. Check coverage of adhesive to tile before starting to install tile. Apply adhesive only to as much area as can be covered within the open time of the adhesive. Set tiles without sliding. Tap tile with block to assure contact with adhesive. Do not damage the tile during taping.

- 3) Grout tile joints with a grout of type recommended by the manufacturer of the adhesive used for setting tile. Color as selected by Owner.
- d. Tile Set With Dry Set Mortar
  - 1) Set floor tiles in dry-set mortar placed in one (1) layer approximately 3/32" thick.
  - 2) Dry-set mortar shall be a mixture of Portland cement with sand and additives imparting water retentivity.
  - 3) Grout floors with Sand-Portland cement grout, color as selected by Owner.
- e. Setting Marble Saddles
  - 1) Set marble saddles in dry-set mortar as specified above where adjacent floor tile is set in dry-set mortar; and set saddles with adhesive as specified above where adjacent floor tile is set with adhesive.

## 3.6 WALL TILE INSTALLATION METHODS

## A. General

Install wall tile and base to comply with requirements indicated below for setting bed methods, TCA installation methods related to subsurface wall conditions and grout types.

- 1. Thick set method, on interior plaster, cement and masonry: mortar bed of 3/4" to 1 1/2" thick comply with TCA W221.
  - a. Commercial Portland Cement Mortar Bed: ANSI A108.1
  - b. Scratch Coat: Portland cement mortar proportioned as per TCA W221.
  - c. Bond Coat: Portland cement paste on workable mortar bed.

- d. Grout: Commercial Portland Cement Grout.
  Compound of Portland cement and additives,
  factory blended to decrease, shrinkage and
  increase moisture resistance, and complying
  with ANSI Al18.6.
- e. Metal Lath: Galvanized expanded metal.
- f. 4 mil polyethylene membrane.
- g. Expansion joints mandatory. Provide in accordance with TCA Method EJ171.
- 2. Thick set method, on interior plaster, cement, and masonry: mortar bed of 3/8" to 3/4" thick comply with TCA W222.
  - a. Commercial Portland Cement Mortar Bed: ANSI A108.1
  - b. Bond Coat: Portland cement paste on workable mortar bed.
  - c. Metal Lath: Galvanized expanded metal.
  - d. Grout: Commercial Portland Cement Grout. Compound of Portland cement and additives, factory blended to decrease, shrinkage and increase moisture resistance, and complying with ANST A118.6.
  - e. 4 mil polyethylene membrane.
  - f. Expansion joints mandatory. Provide in accordance with TCA Method EJ171.
- 3. Thin set method, gypsum board on metal studs: TCA W243.
  - a. Latex Portland Cement Mortar Bond Coat: ANSI A118.4.
  - b. Grout: Polymer modified Portland cement: ANSI A118.7.
  - c. Provide expansion joints in accordance with TCA Method EJ171.

- 4. Thin set method, tile backer board on metal studs: TCA W244.
  - a. Latex Portland Cement Mortar: ANSI Al18.4.
  - b. Grout: Polymer modified Portland cement. ANSI A118.7.
  - c. 4 mil polyethylene membrane required.
  - d. Expansion joints mandatory. Provide in accordance with TCA Method EJ171.

#### 3.7 ADJUSTING

A. Check the tilework installation. Remove defective tile and retile. Leave finished installation free of cracked, chipped, broken, unbonded, and otherwise defective tilework.

### 3.8 GROUT APPLICATION

- A. Where possible, tile should not be grouted sooner than 48 hours after setting.
- B. Clean all joints of dust, dirt, and excessive adhesive. Adhesive may be removed with a sharp knife or solvent.
- C. When grouting wall tile thoroughly soak all joints with clean water. This is important as grout will not cure properly unless thoroughly soaked.
- D. Mix grout with clean water to a consistency of thick cream. Completely fill all joints and allow to set for a few minutes. Remove the surplus grout and finish flush and true. As soon as the grout has reached its initial set, thoroughly wash with a sponge and clean water. Polish with clean, dry cloths.

## 3.9 CLEANING

A. Upon completion of all ceramic tile installation and grouting, thoroughly clean the exposed surfaces so they are free of foreign matter and stains. Clean grout from exposed tile surfaces.

B. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's printed instructions, but not sooner than 14 days after installation. Protect metal and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning. Remove all traces of acid solution upon completion of cleaning process.

### 3.10 PROTECTION

A. As soon as the tile work in each space has been grouted and cleaned, it shall be covered with either reinforced kraft paper (sisal kraft) or other heavy covering. Floor covering shall be kept and maintained until completion of the Work of all trades or as otherwise directed by the Engineer, when it shall be removed without damage to tile or adjoining Work.

+ + END OF SECTION + +



### SECTION 09900

### **PAINTING**

### PART 1 - GENERAL

### 1.1 SUMMARY

### A. Scope:

- 1. The General Contractor shall furnish all labor, materials, equipment and incidentals required to provide painting as shown and specified.
- 2. The extent of painting work may be determined by referring to the Contract Drawings, site inspections, other specification sections and as described in this Section.
- 3. The Work includes the painting and finishing of all exposed existing and new interior and exterior surfaces including, but not limited to, the following:
  - a. All structural steel and all frame members.
  - b. Miscellaneous metals, pipe sleeves and pipe hangers.
  - c. All new and existing exposed piping, fittings, valves and insulation in new and/or existing building(s) as shown on the Contract Drawings and directed by Owner or Engineer.
  - d. All new equipment and associated piping.
  - e. Exposed wood and rough carpentry
  - f. Doors and frames.
  - g. Seal coating building floor and new exposed concrete.
  - h. Interior surfaces of masonry and brick walls.
  - i. Interior walls and ceilings of new structures.

- j. Interior Gypsum Board Surfaces.
- k. Existing surfaces damaged or exposed by the work.
- 1. All work specified to be painted as directed by Owner or Engineer, whether or not specifically listed herein.
- 4. Surface preparation, priming and coats of paint specified are in addition to shop priming and surface treatment specified under this and other sections of the Work.
- 5. The term "paint" as used herein means all coating system materials, which includes pretreatment, primers, emulsions, enamels, stains, varnishes, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.
- 6. The exposed surfaces of all work shall be painted, whether or not colors are designated in any schedule, except where the natural finish of the material is specifically noted as a surface not to be painted. Unless otherwise noted, the term "exposed" as used herein means all items not covered with concrete. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas.
- 7. All exposed structural steel appurtenances, as indicated by the contract drawings and the specifications, which are customarily painted, shall be painted with not less than one shop coat and two field coats, or one prime coat and two finish coats of the appropriate paint.
- 8. Structural and miscellaneous metals covered with concrete, shall only receive a coating compatible with the covering material.
- 9. Piping and equipment identification for all new piping and equipment.

### B. Coordination:

- 1. Review installation procedures under other Sections and coordinate the installation of items that must be field painted in this Section.
- 2. Coordinate the painting of areas that are inaccessible once equipment has been installed.
- 3. Provide finish coats which are compatible with the prime paints used. Review other Sections of these Specifications in which prime paints are to be provided to ensure compatibility of the total coatings system for the various substrates. Contractor shall be responsible for compatibility of all shop primed and field painted Furnish information on the characteristics of the finish materials proposed for use to ensure that compatible prime coats are used. Provide barrier coats over incompatible primers or remove and reprime as required. Notify the Engineer in writing of anticipated problems using the coating systems as specified with substrates primed by others.
- 4. Manufacturers of equipment to receive finish coating in the shop shall submit color charts with shop drawings for color selection by the Owner.
- C. Related Work Specified Elsewhere:
  - 1. Section 07920, Caulking and Sealants.
  - 2. Equipment markers in appropriate equipment section.
- D. Painting Not Included: The following categories of Work are not included as part of the field-applied finish Work or are included in other Sections of these Specifications or in other contracts.
  - 1. Shop Priming: Unless otherwise specified, shop priming of structural metal, miscellaneous metal fabrications, other metal items and such fabricated components as shop-fabricated or factory-built heating and ventilating, instrumentation and electrical equipment or accessories shall conform to applicable requirements of Section 09900 but is

- included under the appropriate Sections of the Specifications.
- 2. Prefinished Items: Unless otherwise shown or specified, do not include painting when factory finishing such as baked-on enamel, baked-on phenolic resin, porcelain, polyvinyl fluoride or other similar finish is specified for such items as, but not limited to, finished mechanical and electrical equipment such as conduits, fans, ductwork, light fixtures and distribution cabinets, aluminum doors and other equipment. Contractor shall be required to touch-up factory finished items with paint supplied by the item manufacturer. Contractor shall field paint damaged prefinished items as directed by the Engineer.
- 3. Metal surfaces of aluminum, stainless steel, chromium plate, bronze, copper, and similar finished materials will not require finish painting, unless otherwise shown or specified.
- 4. Operating Parts and Labels:
  - a. Moving parts of operating units, mechanical and electrical parts such as valve and damper operators, linkages, sensing devices, motor and fan shafts do not require finish painting unless otherwise shown or specified.
  - b. Do not paint over any code-required labels, such as UL and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.
  - c. Remove all paint, coating or splatter inadvertently placed on these surfaces.

# 1.2 QUALITY ASSURANCE

- A. Manufacturer: Provide products manufactured by one of the following:
  - 1. Themec Company, Incorporated.
  - 2. Sherwin Williams

- 3. Or equal.
- B. Applicator Qualifications:
  - 1. Submit the name and experience record of the painting applicator. Include a list of utility or industrial installations painted, responsible officials, architects, or engineers concerned with the project and the approximate contract price.
  - 2. Painting applicators whose submissions indicate that they have not had the experience required to perform the Work will not be approved.
- C. Source Quality Control: Obtain all materials from the same manufacturer unless otherwise approved. Obtain materials only from manufacturers who will:
  - 1. Provide the services of a qualified manufacturer's representative at the project site at the commencement of Work to advise on materials, installation and finishing techniques.
  - 2. Certify long-term compatibility of all coatings with all substrates, both new and existing.
- D. Reference Standards: Comply with applicable provisions and recommendations of the following, except where otherwise shown or specified:
  - 1. ANSI/NSF Standard 61.
  - 2. ANSI A13.1, Scheme for the Identification of Piping Systems.
  - 3. OSHA 1910.144, Safety Color Code for Marking Physical Hazards.
  - 4. AMPP volume 2, Systems and Specifications, Surface Preparation Guide and Paint Application Specifications.
  - 5. Great Lakes Upper Mississippi River Board of State Public Health and Environmental Managers Engineers (Ten States Standards), Recommended Standards for Water Works Latest edition, Painting of Water Works Piping for Public Water Supplies.

### E. Manufacturer's Guarantee:

1. The identification signs and nameplates shall be guaranteed in writing by the manufacturer against color fading, chipping, corroding or any other manufacturing defects for a period of ten (10) years.

# F. Concrete Floor Mock-Up:

Prior to application of concrete floor coating, but 1. after Engineer's approval of floor coating system, the Contractor shall coat a section of the new concrete floor using the approved aggregate and coating specified for final work. Mock-up shall be provided at the site in a location approved by the Engineer. The mock-up shall be of full coating thickness and approximately 5 feet long by 5 feet wide unless otherwise shown. The mock-up shall indicate the proposed range of texture workmanship to be expected in the completed work. The Contractor shall obtain Engineer's and Owner's acceptance of coating qualities of the mock-up before start of concrete floor coating work. Retain and protect mock-up floor area during construction as a standard for judging completed floor coating work. Do not alter, move or destroy mock-up until given written permission by Engineer. Concrete floor coatings that do not meet the approved mockup coating area shall be removed and recoated as required by the Engineer.

### 1.3 SUBMITTALS

- A. Samples: Submit for approval the following:
  - 1. Paint samples for Engineer's review of color and texture only. Compliance with all other requirements is the exclusive responsibility of the Contractor. Provide a listing of the material and application for each coat of each finish sample.
  - 2. Piping and Equipment Identification:
    - a. Submit to the Engineer for approval each type of tag proposed and the manufacturer's standard color chart and letter styles. Tags shall have

stamped on them the information shown on the valve schedules.

- B. Shop Drawings: Submit for approval the following:
  - 1. Copies of manufacturer's technical information, including paint label analysis and application instructions for each material proposed for use.
  - 2. Copies of Contractor's proposed protection procedures in each area of the Work.
  - 3. List each material and cross-reference to the specific paint and finish system and application. Identify by manufacturer's catalog number and general classification.
  - 4. Copies of manufacturer's complete color charts for each coating system.
  - 5. Maintenance Manual: Upon completion of the Work, furnish copies of a detailed maintenance manual including the following information:
    - a. Product name and number.
    - b. Name, address and telephone number of manufacturer and local distributor.
    - c. Detailed procedures for routine maintenance and cleaning.
    - d. Detailed procedures for light repairs such as dents, scratches and staining.
  - 6. Pipe Markers: Copies of manufacturer's technical brochure, including color chart and list of standard markers.
- C. Certificates: Submit for approval the following:
  - 1. Certificates stating that materials meet or exceed Specification requirements.
  - 2. Certificate stating that all coatings are compatible with substrate specified, and factory or field applied prime coats.

3. Safety Data Sheets (SDS), for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings applied on the interior of the building. SDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an SDS does not include a product's VOC content, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the SDS to indicate the VOC content).

# 1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery of Materials: Deliver all materials to the job site in original, new and unopened packages and containers bearing manufacturer's name and label, and the following information.
  - 1. Name or title of material.
  - 2. Manufacturer's stock number and date of manufacture.
  - 3. Manufacturer's name.
  - 4. Contents by volume, for major pigment and vehicle constituents.
  - 5. Batch Numbers
  - 6. Thinning instructions where recommended.
  - 7. Application instructions.
  - 8. Color name and number.
- B. Storage of Materials:
  - 1. Store only acceptable project materials on project site.
  - 2. Store in a suitable location approved by the Paint Manufacturer and accepted by the Owner. Keep area clean and accessible.

- 3. Restrict storage to paint materials and related equipment.
- 4. Comply with health and fire regulations including the Occupational Safety and Health Act of 1970.

# C. Handling:

- 1. All waste and paint rags shall be kept in tightly covered metal containers and the contents shall be safely disposed of at the end of each working day in accordance with all applicable federal, state and local laws and regulations.
- 2. A sufficient number of approved type fire extinguishers shall be provided adjacent to the storage area.

### 1.5 JOB CONDITIONS

### A. Existing Conditions:

- Before painting is started in any area, it shall be broom cleaned and excessive dust shall be removed, and damp surfaces shall be dried.
- Some existing surfaces may exhibit failing coatings, i.e. peeling, chipped and/or cracked. Paint shall be removed to provide clean adhered surface.
- 3. After painting operations begin in a given area, broom cleaning will not be allowed; cleaning shall then be done only with commercial vacuum cleaning equipment.

### B. Environmental Requirements:

- 1. Apply water base paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 55°F and 90°F unless otherwise permitted by the paint manufacturer's printed instructions.
- 2. Apply other paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 65°F and 95°F, unless otherwise permitted by the paint manufacturer's printed instructions.

- 3. Do not apply paint in snow, rain, fog, or mist or when the relative humidity exceeds 85 percent or to damp or wet surfaces, unless otherwise permitted by the paint manufacturer's printed instructions.
- 4. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified by the paint manufacturer during application and drying periods.
- 5. Adequate illumination and ventilation shall be provided in all areas where painting operations are in progress.
- 6. Install piping markers only after all painting and finish Work has been completed.
- C. Protection: Cover or otherwise protect finished work of other trades and surfaces not being painted concurrently or not to be painted.
- D. Manufacturer's Field Service: A qualified representative of the manufacturer shall be available to instruct the painters on any special requirements or techniques for the application of the paints, coatings, etc., at no additional cost to the Owner. Prior to starting any painting, the Contractor shall supply, for use by the Engineer, two wet film thickness gauges and one digital dry film thickness gauge.

### PART 2 - PRODUCTS

### 2.1 MATERIAL QUALITY

- A. Provide the best grade of the various types of coatings suitable for use in water supply and water treatment plants and as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying the manufacturer's identification as a standard, best-grade product will not be acceptable.
- B. Provide primers produced by the same manufacturer as the finish coats. Use only thinners recommended by the paint manufacturer, and use only to recommended limits.

C. Provide paints, and pipe markers of durable and washable quality. Use materials which will withstand normal washing as required to remove grease, oil, chemicals, etc., without showing discoloration, loss of gloss, staining, or other damage.

### 2.2 SUBSTITUTIONS

- A. No substitutions shall be considered that decrease the film thickness, the number of coats, the surface preparation or the generic type of coating specified. Approved manufacturers must furnish the same color selection as the manufacturers specified, including accent colors in all coating systems.
- B. No substitutions of paint containing volatile organic compounds (VOCs) shall be considered where paint is specified which does not contain VOCs.

### 2.3 COLORS AND FINISHES

A. Surface treatments, and finishes, are specified under "Painting Systems" below. All substrates scheduled under "Painting Systems" shall be painted whether or not shown on the Contract Drawings, or in Schedules, unless an item is specifically scheduled as not requiring the painting system scheduled below.

### B. Color Selection:

- Many different colors shall be selected for the Project, in addition to color coding of all piping.
- 2. The Owner reserves the right to select nonstandard colors for all paint systems specified within the ability of the manufacturer to produce such nonstandard colors. Selection of nonstandard colors shall not be cause for the Contractor rejecting Owner's color selections and the Contractor shall supply such colors at no additional expense to the Owner.
- C. After approval of submittals and prior to beginning Work, the Engineer will furnish color schedules for surfaces to be painted listed in the painting systems below.

- D. Color Coding: In general, and unless otherwise specified, all color coding of piping, and equipment shall comply with applicable standards of ANSI A13.1, OSHA 1910.144 and the Ten States Standards, Recommended Standards for Water Works, Current Edition.
- E. Color Pigments: Pure, nonfading, applicable types to suit the substrates and service indicated.
  - 1. Lead: Lead content shall not exceed amount permitted by federal, state and local government laws and regulations.
- F. All painting systems specified are based on brush application except as noted or specified. Other mechanical techniques shall be submitted to the Engineer for approval before these application techniques may be reflected in any paint schedules submitted by the Contractor. Submit proof of acceptability of technique proposed by the paint manufacturer selected.

### 2.4 PAINTING SYSTEMS

- A. Interior CMU walls (unless otherwise specified): Sealer shall be applied with 3/8''-3/4'' nap lambswool or solvent resistant cover and not sprayed.
  - 1. Surface Preparation: Remove grease, oil and all foreign matter as specified in Section 3.2.
  - 2. Product and Manufacturer: Provide one of the following:
    - a. KOP-COAT:
      - 1) Primer: Epoxy Block Filler 1 coat, 10.0
        dry mils per coat.
      - 2) Finish: Hi-Gard 2 coats, 3.0-4.0 dry mils per coat. Second coat on floors to provide a skid resistant finish.

### b. Tnemec:

1) Primer: Series 130 Envirofill - 1 coat, 10.0 dry mils.

2) Finish: Series V69 H.B. Epoxoline - 2 coats, 3.0-4.0 dry mils per coat. Second coat on floors to provide a skid resistant finish.

### c. Sherwin Williams:

- 1) Primer: Pro Industrial HD Block Filler 1 coat, 8-10 mils dft.
- 2) Finish: Macropoxy 646 FC Epoxy 2 coats, 3-5 mils dft per coat. Second coat on floors to provide a skid resistant finish.
- d. Or approved equal.
- B. Factory Primed Structural Steel Members; interior non-Submerged:
  - 1. Surface Preparation: Remove chalk, loose paint, grease, oil, rust, scale, all foreign matter, as specified in Section 3.2.
  - 2. Product and Manufacturer: Provide one of the following:

### a. Tnemec:

- 1) Shop Holding Primer: Building Manufacturer's choice
- Field Primer or field touchup over holding primer: Themec Series 115 1 coat, 2.0-4.0 dry mils per coat.
- 3) Finish: Tnemec Series 1029, 2 coats, 2.0-3.0 dry mils per coat.

### b. Sherwin Williams:

- 1) Field touch up Primer: Pro Industrial
   ProCryl Universal Primer 1 coat, 2-3.5
   mils dft.
- 2) Finish: Shercryl HPA, 2 coats, 2-3 dry mils per coat.

- c. Or approved equal
- C. Ferrous Metals and all Ferrous Piping; Interior Nonsubmerged:
  - 1. Surface Preparation: Blast Cleaning as specified in Section 3.2.
  - 2. Product and Manufacturer: Provide one of the following:

### a. Tnemec:

- 1) Shop Primer: Series V69 H.B. Epoxoline 1 coat, 3.0-5.0 dry mils per coat.
- Field Primer or Field Touch-up: Series V69 H.B. Epoxoline - 1 coat, 3.0-5.0 dry mils per coat.
- 3) Finish: Series V69 H.B. Epoxoline 2 coats, 3.0-5.0 dry mils per coat.

# b. Sherwin Williams:

- 1) Shop Primer: Macropoxy 646 FC Epoxy 1 coat, 3.0-5.0 dry mils per coat.
- 2) Field Primer or Field Touch-up: Macropoxy 646 FC Epoxy 1 coat, 3.0 5.0 dry mils per coat.
- 3) Finish: Macropoxy 646 FC Epoxy, 2 coats, 3.0 5.0 dry mils per coat.
- c. Or approved equal.
- D. Ferrous, Nonferrous Metals, and Galvanized Metals; Exterior Nonsubmerged:
  - 1. Surface Preparation:
    - a. Ferrous Metals: Blast Cleaning as specified in Section 3.2.
    - b. Galvanized and Nonferrous Metal: Cleaning as specified in Section 3.2.

- 2. Product and Manufacturer: Provide one of the following:
  - a. Tnemec:
    - 1) Primer:
      - a) Ferrous Metals: Series V69 H.B. Epoxoline 1 coat, 3.0-5.0 dry mils per coat.
      - b) Nonferrous and Galvanized: None.
    - 2) Intermediate: Series V69 H.B. Epoxoline 1 coat, 4.0-5.0 dry mils.
    - 3) Finish: Series 1095 Endura-Shield Aliphatic Acrylic Polyurethane 1 coat, 2.0-3.0 dry mils.
  - b. Sherwin Williams:
    - 1) Shop Primer: Macropoxy 646 FC Epoxy 1 coat, 3.0-5.0 dry mils per coat.
    - 2) Field Primer or Field Touch-up: Macropoxy 646 FC Epoxy 1 coat, 3.0-5.0 dry mils per coat.
    - 3) Finish: High Solids Polyurethane 250, 1 coat, 3.0-4.0 dry mils per coat.
- E. Galvanized Metal and Nonferrous Metals; Interior, Nonsubmerged:
  - 1. Surface Preparation: Cleaning, as specified in Section 3.2.
  - 2. Product and Manufacturer: Provide one of the following:
    - a. Tnemec:
      - 1) Primer: Series V69 H.B. Epoxoline 1 coat, 2.0-3.0 dry mils.

- 2) Finish: Series V69 H.B. Epoxoline 1 coat, 2.5-3.5 dry mils.
- b. Sherwin Williams:
  - 1) Primer: Macropoxy 646 FC Epoxy- 1 coat, 2.0-4.0 dry mils per coat.
  - 2) Finish: Macropoxy 646 FC Epoxy, 1 coat, 2.0-4.0 dry mils per coat.
- c. Or approved equal.
- F. Submerged or Intermittently Submerged Ferrous Metals; Interior and Exterior.
  - 1. Surface Preparation: Cleaning, as specified in Section 3.2.
  - 2. Product and Manufacturer: Provide one of the following:
    - a. Tnemec:
      - 1) Primer/Finish: Series 22 1 coat, 24.0-30.0 dry mils per coat.
    - b. Sherwin Williams
      - 1) Primer/Finish: Sherplate PW Epoxy 1 coat, 25.0-35.0 dry mils per coat.
    - c. Or approved equal.
- G. All Aluminum in contact with Dissimilar Materials:
  - 1. Surface Preparation: Remove all foreign matter. SSPC-SP1, solvent cleaned.
  - 2. Product and Manufacturer: Provide one of the following:
    - a. Tnemec:
      - 1) Series V69 H.B. Epoxoline 2 coats, 2.0-3.0 dry mils per coat.

- b. Sherwin Williams:
  - 1) Macropoxy 646 FC Epoxy 2 coats, 2.0 4.0 dry mils per coat.
- c. Or approved equal.
- H. Ferrous Metals, Buried Exterior:
  - 1. Surface Preparation: SSPC-SP 10, Near-White Blast, as specified in Section 3.2.
  - 2. Product and Manufacturer: Provide one of the following:
    - a. Tnemec:
      - 1) Shop Primer: Series V69 H.B.
        Epoxoline 1 coat, 3.0-5.0 dry mils per
        coat.
      - 2) Field Primer or Field Touchup: Surface preparation as specified.
      - 3) Finish: Series 46H-413 H.B. Tneme-Tar 2 coats, 8.0-10.0 dry mils per coat.
    - b. Sherwin Williams:
      - 1) Shop Primer: Macropoxy 240 1 coat, 3.0-5.0 dry mils per coat.
      - 2) Finish: TarGuard Coal Tar Epoxy, 2 coats, 8.0 - 10.0 dry mils per coat.
    - c. Or approved equal.
- I. New and existing Interior Concrete Floors and equipment pads: Sealer shall be applied with 3/8"-3/4" nap lambswool or solvent resistant cover and not sprayed.
  - 1. Surface Preparation: Remove grease, oil and all foreign matter as specified in Section 3.2.
  - 2. Product and Manufacturer:

- a. GP 3477 Epoxy Water Emulsion Primer/Sealer by the Sherwin Williams Company (two coats).
- b. L&M Sealhard by Laticrete International.
- c. Or approved equal.
- J. New and existing Interior Concrete Floors: Paint shall be applied with a brush or roller and not sprayed.
  - 1. Surface Preparation: Remove grease, oil and all foreign matter as specified in Section 3.2.
  - 2. Product and Manufacturer: Provide one of the following:
    - a. Tnemec:
      - 1) Primer: Series V69 H.B. Epoxoline 2 coats, 3.0-4.0 dry mils per coat.
      - 2) Finish: Series V69 H.B. Epoxoline 2 coats, 3.0-4.0 dry mils per coat.
    - b. Sherwin Williams:
      - 1) Primer: Macropoxy 646 FC Epoxy 1 coat, 3.0-5.0 dry mils per coat.
      - 2) Finish: Macropoxy 646 FC Epoxy 2 coats, 3.0-5.0 dry mils per coat.
    - c. Or approved equal.
- K. New and Existing Interior Concrete Block and Masonry Walls and Trim: Paint shall be applied with a brush or roller and not sprayed.
  - 1. Surface Preparation: Remove grease, oil and all foreign matter as specified in Section 3.2.
  - 2. Product and Manufacturer: Provide one of the following:
    - a. Tnemec:
      - 1) Primer: Series 130 EnviroFill Block Filler 1 coat, 10.0 dry mils.

- 2) Finish: Series V69 H.B. Epoxoline 2 coats, 3.0-5.0 dry mils per coat.
- b. Sherwin Williams:
  - Primer: Pro Industrial Heavy Duty Block
    Filler 2 coats, 8.0 10.0 dry mils per
    coat.
  - 2) Finish: Macropoxy 646 FC Epoxy 2 coats, 3.0-5.0 dry mils per coat.
- c. Or approved equal.
- L. New Exterior Masonry Clear Coating:
  - 1. Surface Preparation: Remove Mortar and efflorescence as specified in Section 3.2.
  - 2. Product and Manufacturer: Provide one of the following:
    - a. Hydrozo Clear Double 7 by Hydrozo Coatings Company (2 coats).
    - b. Thompson's Water Seal by E.A. Thompson Company (2 coats).
    - c. Conflex 7% Siloxane CF31T0007, by Sherwin Williams (1 Flood coat)
    - d. Or approved equal.
- M. New and Existing Gypsum Wallboard, Exposed Finish Carpentry, Interior:
  - 1. Surface Preparation:
    - a. Remove all foreign matter.
    - b. Fill voids created by securement devices with joint compound to achieve smooth surface.
    - c. Apply joint tape and joint compound to all lateral joints and at perimeter of ceilings.
    - d. Sand joint compound with fine grit, open coated sandpaper to provide a smooth, flat surface.

If additional joint finishing is required to provide a smooth, flat surface, the same joint compound or a ready mix spackling compound should be used.

- e. Remove dust by wiping with clean rags.
- 2. Product and Manufacturer: Provide the following:
  - a. Tnemec:
    - 1) Primer: Series 151-1051 Elasto-Grip FC 1 coat, 1.0-2.0 dry mils per coat.
    - 2) Finish: Series 113 or 114 H.B. Theme Tufcoat 2 coats minimum, 4.0-5.0 total dry film thickness.
  - b. Sherwin Williams:
    - 1) Primer: ProMar 200 Zero VOC Primer 1 coat, 1.0 2.0 dry mils per coat.
    - 2) Finish: Pro Industrial Water Based
       Catalyzed Epoxy 2 coats, 3.0 4.0 dry
       mils per coat.
  - c. Or approved equal.

# 2.5 PIPING AND EQUIPMENT IDENTIFICATION

- A. Identification Signs:
  - 1. Lettering of Titles:
    - a. Letter size shall be as indicated in the following table:

Outside Diameter of Pipe	
or Covering	Size of Legend
3/4-in to $1-1/2-in$	1/2-in
1-1/2-in to 2-in	3/4-in
2-1/2-in to 6-in	1-1/2-in
8-in to 10-in	2-1/2-in
Over 10-in	3-in

b. Letter type shall be Gothic Capital, upper case. Arrow shall match letter type and size. Colors of lettering and backgrounds shall match colors listed below.

# 2. Sign Materials:

- a. Signs and arrows shall be pressure sensitive vinyl tape with pressure sensitive vinyl tape banding. Banding in humid areas, as determined by the Engineer shall be stainless steel.
- b. Product and Manufacturer: Provide one of the
   following:
  - 1) Opti-Code Special Markers by Seton Name Plate Corporation.
  - 2) Custom Self-sticking Marker System by W.H. Brady Company.
  - 3) Or approved equal.

# 3. Titles for Equipment:

a. Titles shall be provided on all equipment using 1-inch high letters same style and materials as specified above. Where more than one piece of the equipment item to be titled exists, the items shall be numbered consecutively as indicated on the mechanical drawings or as directed by the Engineer. Titles shall be composed in more than one line if required and justified on the left hand side as follows (for example):

PUMP NO. "X"

4. Metal Tags: For valves and pipelines smaller than 3/4-inch in diameter, securely fasten metal tags, 2-1/2-inch by 1/2-inch, of 17 Birmingham Stubs Gauge Brass with lettering etched and filled with enamel. Tags shall be approved by the Engineer.

# B. Additional Signs and Nameplates:

1. In addition to the legends specified herein the Engineer may order the Contractor to furnish and install additional identification signs, arrows and nameplates at no additional cost to the Owner. Such additional signs may be requested near completion of the Work and shall be limited to no more than 10 signs for each of the types specified. The legends and color combinations for additional signs shall conform to the requirements specified herein.

# C. Legend for Valve Tags:

1. The Contractor shall be responsible for furnishing and installing tags for all valves required for their own work. Contractor shall submit to the Engineer a valve schedule containing all valves required for their work. The schedule shall contain for each valve, the location, type, a number, words to identify the valve's function, type of operator and the normal operating position. The information contained in the valve schedules shall be coded on the tags in a system provided by the Engineer. Each valve shall be coded and identified by the Engineer utilizing a combination of up to twelve letters and numbers.

### D. Colors:

1. Standard Colors: Pipe line signs, equipment nameplates and finish coats of paint for pipe lines and equipment shall be coded in basic colors. Colors shall be brilliant, distinctive shades matching the following safety colors in accordance with ANSI Z53.1 color specifications for safety colors and other basic colors as hereinafter specified.

TABLE OF STANDARD COLORS

Color	Designation
White	Safety
Yellow	Safety
Orange	Safety
Red	Safety
Black	Safety
Blue	Safety

### TABLE OF STANDARD COLORS

Color	Designation
Green Gray Brown	Safety ANSI No. 61
Light Green Charcoal	**
Olive Green	***
Aqua	\$
Light Brown Dark Blue	\$\$ \$\$\$

- \* The color "Brown" for paints shall be equivalent to Tnemec Terra Cotta 07RD.
- \*\*The color "Light Green" for paints shall be equivalent to Tnemec Aztec Grass 52GN.
- \*\*\* The color "Charcoal" for paints shall be equivalent to Tnemec Deep Space GR34.
- \*\*\*\* The color "Olive" for paints shall be equivalent to Tnemec Balsam 91GN.
- \$ The color "Aqua" for paints shall be equivalent to Tnemec Aqua Sky 10GN.
- \$\$ The color "Light Brown" for paints shall be equivalent to Tnemec Desert Sands 04BR.
- \$\$\$ The color "Dark Blue" for paints shall be equivalent to Tnemec Old Glory Blue 78BL.

# 2. Color of Pipe Lines:

- a. All pipe lines and equipment shall be painted in conformity with the requirements of this section and the paint schedules contained on the Drawings. The color of the final coats of paint shall be color coded.
- b. General Color Code: Unless otherwise specified, the following color code should be used:

Pipe Line	Color
Finished (potable) Water Piping Raw Water Piping Well/Booster Blowoff PTAS Influent PTAS Effluent / Booster Pump Influent GAC Influent GAC Effluent GAC Blowoff Backwash Waste Clearwell Overflow Lube Water Generator Engine Exhaust Generator Fill and Vent Vent Pipes Electrical Conduit Natural Gas Carbon Fill Carbon Suction Pressure Relief Air Release Vent Roof Drains Chlorine (gas and solution)	Blue Olive Green Olive Green Olive Green Olive Green Aqua Aqua Light Brown Light Brown Aqua Blue Orange Red Gray Gray Gray Red Gray Gray Gray Gray Gray Gray Gray Gray
Caustic	Yellow with Green Band

Vents and drains shall be in the same color combination as the contents of equipment vented and drained.

- c. The color of the final coats shall match as closely as possible without custom blending, the color tabulated under Background for the specific pipe line service as given in the General Color Code tabulated previously.
- d. Where aluminum or stainless steel is specified for pipe, duct work or insulated jackets the exterior shall not be painted unless otherwise directed by the Engineer or Owner.
- e. Flanges, flexible couplings, valves and fittings shall be painted with the specified color code.

# E. Spare Parts and Accessories:

- 1. Each contractor shall furnish the following spare parts and accessories:
  - a. For every 20 pipe identification signs installed:
    - 1) One complete mounting assembly.
  - b. For every 20 nameplates installed:
    - 1) One complete nameplate mounting assembly.
  - c. For every 20 valve identification tags:
    - 1) One stainless steel cable and splice.
- 2. All spare parts and accessories shall be suitably boxed and marked for storage and reordering.

### PART 3 - EXECUTION

### 3.1 INSPECTION

- A. Contractor and their applicator shall examine the areas and conditions under which painting Work is to be performed and notify the Engineer in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the Engineer.
- B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to the formation of a durable paint film.

### 3.2 SURFACE PREPARATION

### A. General:

 Perform all preparation and cleaning procedures as specified herein and in strict accordance with the paint manufacturer's instructions for each particular substrate and atmospheric condition.

- 2. Remove all hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish painted, or provide surface applied protection prior to surface preparation and painting operations. Remove, if necessary, for the complete painting of the items and adjacent surfaces. Following completion of painting of each space or area, reinstall the removed items by workmen skilled in the trades involved.
- 3. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning. Schedule the cleaning and painting so that dust and other contaminants from the cleaning process will not fall in wet, newly painted surfaces.
- No interior painting shall be started until the 4. structure has been enclosed, ventilated thoroughly dried out, as approved by the Engineer. Apply materials under adequate illumination and ventilation. Special fans shall be provided when natural ventilation is insufficient and if required, face masks shall be provided for the painters. Written consent of the Engineer will be required before building fans may be used. temperature of rooms at 65°F minimum where varnish, lacquer or enamel is being applied and at 50°F minimum during other painting and finishing. exterior painting shall be started in rainy, snowy, damp or frosty weather, or until surfaces are thoroughly dry. Exterior painting shall be done only when air temperature is 40°F or above and only in dry weather. Allow exterior paints and finishes to dry at least 48 hours between coats. interior paints to dry at least 24 hours between coats or as otherwise indicated by the manufacturer. Allow enamels, lacquers and varnishes to dry at least forty-eight hours between coats. Remove dust well before succeeding coat is applied. Allow additional drying time if conditions warrant to assure that all coats are perfectly dry before applying succeeding coats. Remove or protect during painting all finish hardware, accessories, fixtures and similar items installed prior to painting and not required to be

painted. If removed, carefully replace and adjust on completion of painting. All work shall be performed by experienced and competent painters in conformance with the requirements of the Specifications.

5. All surfaces which were not shop painted or which were improperly shop painted, and all abraded or rusted shop painted surfaces, which are to be painted, as determined by the Engineer, shall be prepared as specified below.

### B. Ferrous Metals:

- Clean ferrous surfaces including structural steel and miscellaneous metal to be shop primed, of all oil, grease, dirt, mill scale and other foreign matter by near-white blast cleaning complying with AMPP/SSPC-10.
- 2. Clean submerged ferrous surfaces including structural steel and miscellaneous metal to be shop primed, of all oil, grease, dirt, mill scale and other foreign matter by white blasting complying with AMPP/SSPC-SP 5.
- 3. Clean non-submerged, ferrous surfaces that have not been shop-coated of all oil, grease, dirt, loose mill scale and other foreign substances by near-white blast cleaning, complying with AMPP/SSPC-SP 10.
- 4. Clean submerged ferrous surfaces that have not been shop-coated or that, in the opinion of the Engineer, have been improperly shop coated, of all oil, grease, dirt, mill scale and other foreign matter by white blasting complying with AMPP/SSPC-SP 5.
- 5. Treat bare and blasted or pickled clean metal with metal treatment wash coat, prior to priming only if recommended by the paint manufacturer.
- 6. Touch-up shop-applied prime coats which have damaged or bare areas, with primer recommended by the coating manufacturer after commercial blasting complying with SSPC-SP 6.

- 7. Ferrous metals with existing coatings shall be prepared as specified in Section 3.2(E).
- C. Nonferrous Metals Surfaces: Clean nonferrous surfaces in accordance with the coating system manufacturer's instructions for the type of service, metal substrate, and application required.

### D. Galvanized Surfaces:

- 1. Render free from oil and surface contaminants with a nonpetroleum based solvent, recommended by the coating manufacturer, complying with AMPP/SSPC-SP 1.
- 2. Do not use chromate treatments on galvanized surfaces to be painted. Remove all chromate treatments by sanding or by other techniques as recommended by the paint manufacturer at no additional cost to the Owner.

# E. Ferrous Surfaces with Existing Coatings:

- General: All grease, oil heavy chalk, dirt, or other contaminants shall be removed by solvent or detergent cleaning prior to abrasive blast cleaning. The generic type of the existing coatings shall be determined by laboratory testing.
- 2. Abrasive Blast Cleaning: The Contractor shall provide the degree of cleaning specified in the coating system schedule for the entire surface to be coated. If the degree of cleaning is not specified in the schedule, deteriorated coatings shall be removed by abrasive blast cleaning to SSPC-SP6, Commercial Blast Cleaning. Areas of tightly adhering coatings shall be cleaned to AMPP/SSPC-SP7, Brush-off Blast Cleaning, with the remaining thickness of existing coating not to exceed 3 mils.
- 3. Incompatible Coatings: If coatings to be applied are not compatible with existing coatings the Contractor shall apply intermediate coatings per the paint manufacturer's recommendation for the specified coating system or shall completely remove the existing coating prior to abrasive blast cleaning. A small trial application shall be

- conducted for compatibility prior to painting large areas.
- 4. Unknown Coatings: Coatings of unknown composition shall be completely removed prior to application of new coatings.

### F. Concrete surfaces:

1. Prepare concrete surfaces in accordance with AMPP/NACE No. 6/SSPC-SP13 Joint Surface Preparation Standards and ICRI Technical Guidelines. Abrasive blast, shot-blast, water jet or mechanically abrade concrete surfaces to remove laitance, curing compounds, hardeners, sealers and other contaminants and to provide a minimum ICRI-CSP 3 or greater surface profile. Large cracks, voids and other surface imperfections should be filled with a recommended filler or surfacer.

### 3.3 MATERIALS PREPARATION

### A. General:

- 1. Mix and prepare painting materials in strict accordance with the manufacturer's directions.
- 2. Do not mix coating materials produced by different manufacturers, unless otherwise permitted by the manufacturer's instructions.
- 3. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing, and application of paint in a clean condition, free of foreign materials and residue.
- 4. Stir all materials before application to produce a mixture of uniform density, and as required during the application of the materials. Do not stir any film which may form on the surface into the material. Remove the film and, if necessary, strain the material before using.

### 3.4 APPLICATION

### A. General:

- 1. Apply paint by brush or roller. Other mechanical application techniques such as air spray, or airless spray in accordance with the manufacturer's directions and recommendations of Paint Application Specifications No. 1 in SSPC Vol. 2 (or equivalent AMPP standard0, where applicable shall be used only as approved by the Engineer. Use brushes best suited for the type of material being applied. Use rollers of carpet, velvet back, or high pile sheep's wool as recommended by the paint manufacturer for material and texture required.
- 2. The number of coats and paint film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has completely dried.
- 3. Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance. This is of particular importance regarding intense primary accent colors. Ensure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a film thickness equivalent to that of flat surfaces.
- 4. Finish exterior doors on tops, bottoms, and side edges the same as the exterior faces, unless otherwise specified.
- 5. Install rubber gaskets to prevent contact between dissimilar metals. Paint aluminum parts in contact with dissimilar materials as specified with appropriate primer.
- 6. Use of thinners at any time shall have approval of the Engineer, Owner, and paint manufacturers.
- 7. Omit field primer on metal surfaces which have been shop primed; touch-up paint shop prime coats only when approved by Engineer.

- B. Heating, Ventilating and Electrical Work:
  - 1. Ventilating items to be painted include, but are not limited to, the following:
    - a. Hangers and supports.
    - b. Motors, mechanical equipment and supports.
    - c. Accessory items.
  - 2. Electrical items to be painted include, but are not limited to, the following:
    - a. Switchgear, panels, junction boxes, motor control centers, motors and accessories.
- C. Minimum Coating Thickness: Apply each material at not less than the manufacturer's recommended spreading rate, and provide total dry film thickness as specified. Apply extra coat if required to obtain specified total dry film thickness.
- D. Scheduling Painting:
  - 1. Apply the first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
  - 2. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
- E. Prime Coats: Recoat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects caused by insufficient sealing.
- F. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage.

# G. Brush Application:

- 1. Brush-out and work all brush coats onto the surfaces in an even film. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable. Neatly draw all glass and color break lines.
- 2. Brush apply all primers and first coats, unless otherwise permitted to use mechanical applicators.

# H. Mechanical Applicators:

- 1. Use mechanical methods for paint application when permitted by governing ordinances, paint manufacturer, and approved by Engineer. If permitted, limit to only those surfaces impracticable for brush applications.
- 2. Limit roller applications, if approved by the Engineer, to interior wall finishes for second and third coats. Apply each roller coat to provide the equivalent hiding as brush-applied coats.
- 3. Confine spray application to metal framework, siding, decking, wire mesh and similar surfaces where hand brush work would be inferior and to other surfaces specifically recommended by paint manufacturer.
- 4. Wherever spray application is used, apply each coat to provide the equivalent hiding of brush-applied coats. Do not double back with spray equipment for the purpose of building up film thickness of 2 coats in one pass.
- I. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish, or repaint work not in compliance with specified requirements as required by the Engineer.

### J. Paint Work:

1. Undercoats shall be of approximate shade of final coat, but each coat shall be of slightly different tint. Each coat shall be inspected and approved before application of the succeeding coats, otherwise no credit for coat applied will be given and the work in question shall be recoated.

- 2. Finished surface shall be uniform in finish and color and free from brush marks, sagging, rippling and other imperfections. Should any coat be judged unsatisfactory, the coat shall be sandpapered or otherwise cleaned off and another coat applied. If the undercoating is disturbed, complete refinishing will be required.
- 3. Finish all returns, edges and recesses which will be exposed in the finished work and which will be seen from any angle to match the adjacent work.
- 4. Edges of paint or finish adjoining other materials or colors shall be sharp and clean without overlapping. Should workmanship be found defective, proper preparatory work shall be done and additional coats applied as necessary to give a finish in accordance with specified requirements.
- K. After completion of each coat of paint, Contractor shall notify Engineer. After inspection, checking of film thickness and approval by Engineer, proceed with the succeeding coat.

# 3.5 PROTECTION

- A. Furnish and lay drop cloths in all areas where painting work is being done to protect floors and all other adjacent work and materials from defacement.
- B. Protect the installed work and the work of other contractors, whether to be painted or not, from the Work of this Section. Leave all such work undamaged. Correct all damages by cleaning, repairing or replacing, and repainting, as acceptable to the Engineer.
- C. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove all temporary protective wrappings provided for protection of this contract and other contracts after completion of painting operations.

# 3.6 CLEANUP

A. During the progress of the Work, remove from the site all discarded paint materials, rubbish, cans and rags at the end of each workday.

- B. Upon completion of painting Work, clean all paintspattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.
- C. At the completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces as determined by the Engineer.

# 3.7 INSTALLATION OF PIPE AND EQUIPMENT IDENTIFICATION SIGNS, NAMEPLATES AND TAGS

A. The name of the materials in each pipeline and, alongside this, an arrow indicating the direction of flow of fluids, shall be indicated on each pipe system. Titles shall also appear directly to each side of any wall the pipeline breaches, adjacent to each side of the valve, pump, filter, chemical tank, and all pieces of equipment. Pipe marking labels and arrows shall be located at intervals not to exceed 30 continuous linear feet apart, including any fraction thereof:

### 1. Material of Construction:

- a. Acrylic plastic with UV inhibitor.
- b. One piece.
- c. Visibility 360° on pipe sizes less than 6-inch diameter.
- d. Minimum legend Display on pipe circumference -4.
- e. Mounting/Installation:
  - 1) For pipes less than 6-inch dia. snap-type with no glues, adhesives or straps.
  - 2) For pipes 6-inch dia. and larger straparound with nylon ties.
- f. Letter size shall conform to ANSI STD.A13.1.

#### 2. Product and Manufacturer:

- a. Set Mark Pipe Markers as distributed by Seton Name Plate Co., New Haven, Connecticut.
- b. Or approved equal.
- B. Titles shall identify the contents by complete name at least once in each space through which it passes and thereafter by generally recognized abbreviations, letters or numerals as approved by the Engineer. Identification title locations shall be determined by the Contractor but in general they shall be placed where the view is unobstructed and on the two lower quarters of pipe or covering where they are overhead. Titles should be clearly visible from operating positions especially those adjacent to control valves.
- C. Signs on large valves shall be located on or adjacent to the valve itself. Tags for smaller valves shall be attached to bonnet or flange bolts. Attachment of tags or signs to handwheels of valves will not be permitted.
- D. Nameplates shall be located on equipment bases and on structures at readily visible levels in such positions relative to the equipment and structures as to prevent damage to the nameplate.

#### 3.8 GUARANTEE

A. All work under this Section of the Specifications shall be guaranteed against checking, cracking, peeling, discoloration or other defects due to improper materials, or workmanship, due to improper preparation of the surfaces, or due to the painting, varnishing, etc., of surfaces which were not in proper condition to receive paint, varnish or other painter's materials and such unsatisfactory work shall be refinished in accord with the Guarantee requirements of the Contract Documents.

+ + END OF SECTION + +



# DIVISION 15 - MECHANICAL



#### SECTION 15011

### MECHANICAL GENERAL REQUIREMENTS

#### PART 1 - GENERAL

## 1.1 DESCRIPTION

A. Under this Section, the Mechanical Contractor shall furnish all labor, materials and equipment for Mechanical General Requirements, as shown on the Plans, as specified and/or directed.

#### 1.2 REFERENCES

- A. The publications listed below and their latest revisions form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 1. Code of Federal Regulations (CFR) Publications:

29-1910-SUBPART O Machinery and Machine Guarding

29-1910.219 Mechanical Power-Transmission Apparatus

### 1.3 RELATED REQUIREMENTS

- A. Division 1 Special Conditions
- B. Division 15 Mechanical

#### 1.4 SUBMITTALS

A. Submit shop drawings, manufacturer's data, publication compliance, certified test reports, and manufacturer's certificates of compliance for equipment, materials and finish, and pertinent details for each system where specified in each individual section, and have them approved before procurement, fabrication, or delivery of the items to the job site. Shop drawings shall be accompanied by a letter of transmittal, and all shop drawings shall be suitably identified with the name of the project, contract number, Contractor's name, date

and initials indicating approval of such submittal by the Contractor under the applicable specification. Partial submittals will not be acceptable and will be returned without review. Submittals shall include the manufacturer's name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and the specific technical paragraph reference which specifies each item, applicable industry and technical society publication references, and other information necessary to establish contract compliance of each item to be furnished.

- 1. Manufacturer's Data: Submittals for each manufactured item shall be current manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog cuts.
- Shop Drawings: Drawings shall include floor plans, 2. sectional views, wiring diagrams, and installation details of equipment; and equipment identifying and indicating proposed location, layout and arrangement of items of equipment, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Wiring diagrams shall identify circuit terminals, and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings of plans, sections, and elevations shall be to a standard scale utilizing standard paper dimensions, with scale noted, and indicate adequate clearance for the operation, maintenance, replacement of operating equipment devices.
- 3. Manufacturer's Certificates of Compliance: Submit certification from manufacturer attesting that materials and equipment to be furnished for this project comply with the requirements of this specification and of the reference publications. Pre-printed certifications will not be acceptable; certifications shall be the manufacturer's original; certifications shall be not more than one year old. The certification shall not contain statements that could be interpreted to imply that the product does not meet all requirements specified, such as "as good as"; "achieve the same

end use and results as materials formulated in accordance with the referenced publications"; "equal or exceed the service and performance of the specified material". The certification shall simply state that the product conforms to the requirements specified. Certificates shall be signed by the manufacturer's official authorized to sign certificates of compliance.

#### 1.5 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI)
- B. American Society for Testing and Materials (ASTM)
- C. National Electrical Manufacturers Association (NEMA)
- D. American Society of Mechanical Engineers (ASME)
- E. American Gas Association (AGA)
- F. American Refrigeration Institute (ARI), and
- G. Underwriters' Laboratories (UL),
  - 1. Independent Testing Organization Certificate: In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing and approved by the Engineer. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

#### 1.6 OPERATION AND MAINTENANCE MANUAL

A. Furnish an operation and maintenance manual for each item of equipment. Furnish three copies of the manual bound in hardback binders or an approved equivalent. Furnish one complete manual to the Owner's Representative for review and approval not more than 90 calendar days after an item is approved, but at least 60 calendar days prior to field acceptance testing of the item. Furnish the remaining manuals at least 60 days prior to contract completion. Inscribe the following identification on the cover: the words "OPERATION AND

MAINTENANCE MANUAL", the name and location of the equipment or the building, the name of the Contractor, and the contract number. The manual shall include the addresses, and telephone numbers of each subcontractor installing equipment, and of the local representatives for each item of equipment. The manual shall have a table of contents and be assembled to conform to the table of contents with the tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in. The manual shall include: wiring and control diagrams with data to explain detailed operation and control of each item of equipment; a control sequence describing start-up, operation and shut-down; description of the function of each principal item of equipment; the procedure for starting; the procedure for operating; shut-down instructions; installation instructions; maintenance instructions; lubrication schedule including type, grade, temperature range, and frequency; safety precautions, diagrams, and illustrations; procedures; performance data; and parts list. The parts lists for equipment shall indicate the sources of supply, recommended spare parts, and the service organization which is reasonably convenient to the project site. The manual shall be complete in all respects for equipment, controls, accessories, and associated appurtenances provided.

## 1.7 CATALOGED PRODUCTS

A. Materials and equipment shall be cataloged products of manufacturers regularly engaged in production of such materials or equipment and shall be manufacturer's latest design that complies with the specification requirements. Materials and equipment shall duplicate items that have been in satisfactory commercial or industrial use. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the items need not be the products of the same manufacturer. Each item of equipment shall have the manufacturer's name, address, model number and serial number on the nameplate securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

## 1.8 LAYOUT OF THE WORK

- A. Coordinate the proper relation of the work to the building structure, existing utilities and to the work of all trades. Visit the premises and become familiar with the dimensions in the field, and advise the Director's Representative of any discrepancy before performing any work.
  - 1. Contract Drawings: The Contract Drawings represent the general intent as to piping and equipment arrangements. All locations and dimensions shown shall be field verified and minor alterations made if so required. Where dimensions are not given for the location and arrangement of mechanical systems, locations may be assumed to be approximate, and may be altered if required. Major modifications to the indicated arrangements shall be approved by the Owner's Representative prior to the installation of mechanical systems. Schematic diagrams represent the overall system requirements and do not necessarily indicate the physical orientation, location or dimensions of that system.
  - 2. Record Drawings: The Contractor shall maintain a record of the progress of the work and shall submit three (3) sets of As-Built Drawings upon completion of the project.

### 1.9 MANUFACTURER'S RECOMMENDATIONS

A. Unless otherwise stated in the Contract Specifications, all new equipment items, and specialties shall be installed in strict accordance with the recommendations of the manufacturer of the items being installed. Prior to the installation of new items, the Contractor shall submit to the Owner's representative printed copies of the manufacturer's installation recommendations. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material. Failure to install items in accordance with manufacturer's recommendations can be cause for rejection of the work items installed.

## 1.10 DELIVERY, STORAGE, AND HANDLING

A. Properly store, adequately protect, and carefully handle equipment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations, and as approved by the Engineer. Replace damaged or defective items.

## 1.11 SAFETY REQUIREMENTS

- A. Equipment Safety: Fully enclose or properly guard in accordance with 29 CFR 1910.219 belts, pulleys, chains, gears, couplings, projecting setscrews, keys, rotating parts, and other power transmission apparatus, located where persons can come in close proximity thereto. Points of operation, ingoing nip points, and machinery producing flying chips and sparks shall be guarded in accordance with the applicable portions of 29 CFR 1910-SUBPART O. Provide positive means of locking out equipment so that equipment cannot be accidentally started during maintenance procedures. High-temperature equipment and piping so located as to endanger personnel or create a fire hazard shall be properly guarded or covered with insulation of the type specified.
- B. Access: Provide catwalks, maintenance platforms, and guardrails where required for safe operation and maintenance of equipment. Provide ladders or stairways to reach catwalks and maintenance platforms. Ensure that access openings leading to equipment are large enough to carry through routine maintenance items such as filters and tools.
- C. Warning Sign: Provide a permanent placard or sign at the entrance to confined spaces contained in the equipment. The sign shall warn personnel not to enter the space until the atmosphere inside has been tested and systems have been de-energized.

## 1.12 ELECTRICAL REQUIREMENTS

A. Motors, controllers, contactors, and disconnects shall conform to and shall have electrical connections provided under Division 16 - Electrical. Furnish internal wiring for components of packaged equipment as an integral part of the equipment. Power wiring and

conduit for field installed equipment shall be provided under and conform to the requirements under

#### 1.13 SPECIAL CONDITIONS

- A. The Contractor must be aware that work may be performed within or around occupied and/or operating facilities and shall be responsible to coordinate with the Owner regarding planned interruptions to mechanical and electrical services, and the contractor's bid shall include considerations for scheduling such interruptions.
  - 1. Protection of Existing Work: The Contractor shall take all necessary precautions to insure against damage to existing work to remain in place, or to be reused. The Contractor shall insure that structural elements are not overloaded and additional structural supports required as a result of any cutting, removal or demolition work performed under any part of this Contract are added. The Contractor shall minimize disruption of existing non-contract work areas as much as possible.
  - 2. Upon damage to existing equipment, buildings and/or structures, the Contractor shall immediately notify the Owner. All damages shall be repaired by the Contractor, or shall be replaced if beyond repair to match the existing to the Owner's satisfaction.
  - 3. Protection of Buildings from the Weather: The interior of the buildings and all materials and equipment shall be protected from the weather at all times.
  - 4. Protection of Personnel: Where the safety of non-contractor personnel is endangered in the area of the work, barricades shall be used. Additional protection shall be provided, if required, to preserve the safety of non-contractor personnel in the immediate area of the work.
  - 5. Protection of existing systems: The Contractor shall take all needed precautions to prevent the ingress of dust, dirt, debris, and other contaminants resulting from his work, from entering

existing ventilation, plumbing supply or drainage systems. Systems being modified shall be plugged, capped, dammed, or otherwise isolated from new work in progress until work is complete and final connections are to be made. The Contractor shall be responsible for the cleaning of existing systems should they become contaminated as a result of his work, including but not limited to purging or vacuuming of system components and replacement or washing of filters and strainers. Repair or replacement of equipment or devices, damaged as a result of debris or contamination, shall be at the Contractor's expense.

#### 1.14 INSTRUCTION TO OWNER'S PERSONNEL

Α. When specified in other sections, furnish the services of competent instructors to give full instruction to the designated Owner's personnel in the adjustment, operation, and maintenance, including pertinent safety requirements, of the specified equipment or system. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Owner for regular operation. The number of days (8 hours per day) of instruction furnished shall be as specified in the individual section. When more than 4 days of instruction are specified, use approximately half of the time for classroom instruction. Use other time for instruction with the equipment or system. When significant changes or modifications in the equipment or system are made under the terms of the Contract, provide additional instruction to acquaint the operating personnel with the changes or modifications.

## PART 2 - PRODUCTS (NOT USED)

#### PART 3 - EXECUTION

#### 3.1 SCOPE OF WORK

A. The Mechanical Contractor shall provide all required labor, materials, equipment, and associated services as

described below and as detailed elsewhere in the contract documents. Work performed shall be complete in every detail, based on standard workmanlike practices, code compliance requirements, and manufacturer's instructions, as to satisfy the function and intent of the design. Refer to section 3.2 herein.

- B. The responsibility of the Mechanical Contractor shall include, but not strictly be limited to, the following:
  - 1. Provide and install new supply fan, including required mounting/support hardware.
  - 2. Provide and install new exterior louver. Coordinate with General Contractor for location and size of openings. General Contractor shall create and prepare openings for louver installation.
  - 3. Provide motorized damper with actuator for louver scheduled to have same.
  - 4. Provide electric duct heater as scheduled.
  - 5. Provide and locate thermostat for duct heater and fan control.
  - 6. Provide galvanized sheet metal ductwork, including required mounting/support hardware, trim and accessories.

## 3.2 ITEMS NOT SPECIFIED

- A. Standards for Materials and Products: Where no kind of quality of material is directly specified, a first-class standard article as approved by the Engineer shall be furnished. All materials and equipment to be furnished and installed shall be new and free from all defects.
- B. Common typical items not shown or specified but necessary for its proper installation and finishing, and not otherwise supplied with specified equipment, shall be included in the Contractor's estimate, the same as if hereby specified or shown. Such items shall include, but not be limited to, standard fasteners, adhesives, shims, cover plates and bungs, brackets, and clips.

#### 3.3 INTERPRETATION OF CONTRACT DOCUMENTS

A. Should any ambiguities or discrepancies be found in the project documents to which the Contractor has failed to call attention to before submission of his bid, then the Engineer shall interpret the intent of the contract documents, and the Contractor hereby agrees to abide by the Engineer's interpretation and agrees to carry out the work in accordance with the decision of the Engineer. It is expressly stipulated that neither the instructions nor the specifications shall take precedence, one over the other, and it is further stipulated that the Engineer may interpret or construe the specifications of the work, and of that question the Engineer shall be the sole judge.

#### 3.4 SITE LOGISTICS

- A. Storage of Materials and Equipment: The Contractor shall place and store their materials as directed. Each Contractor shall be responsible for providing secure temporary storage for their materials and equipment, including such items as storage containers, temporary sheds, lockers, fencing and tool boxes. Temporary storage shall be removed from the site upon completion of work. The Owner shall not be responsible for securing the Contractor's materials or property, and shall not be held liable for damage or theft of inadequately stored materials or equipment.
- B. Waste Management: The Contractor shall at all times keep the premises free from accumulations of waste material or rubbish caused by his machines, materials, employees, or work and shall locate waste in designated areas as directed. All waste materials and demolished equipment shall be disposed of in an approved, legal manner. The Owner reserves the right to claim materials and equipment removed as part of this contract, and upon request the Contractor shall turn over such items to the Owner.
- C. Coordination with Other Trades: The Contractor shall be proactive in coordinating their work with that of other trades, including but not limited to temporary extension, removal or relocation of services or equipment under the responsibility of other trades. The Contractor shall coordinate for temporary openings in

existing structures to permit the removal or installation of materials and equipment where necessary, and unless otherwise specified the cost of providing these temporary openings shall be borne by the Contractor as included in the contract.

+ + END OF SECTION + +



## SECTION 15140

#### SUPPORT AND ANCHORS

#### PART 1 - GENERAL

#### 1.1 GENERAL

A. The General Provisions of the Contract, including General and Supplementary General Conditions and Division 1 General Requirements, apply to the work specified in this Section.

#### 1.2 WORK INCLUDED

- A. Pipe, duct, and equipment hangers, supports, and associated anchors.
- B. Sleeves and seals.

## 1.3 SUBMITTALS

- A. Submit shop drawings in accordance with Section 15011.
- B. Indicate hanger and support framing and attachment methods.

## PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS PIPE HANGERS & SUPPORTS

- A. B-line
- B. Miro Industries
- C. Approved equal

## 2.2 PIPE HANGERS AND SUPPORTS

- A. Hangers for Pipe Sizes 1/2 inch to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
- B. Hangers for Pipe Sizes 2 to 4 inch and Cold Pipe Sizes 6 inch and over: Carbon steel, adjustable, clevis.

- C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- D. Wall Support for Pipe Sizes to 3 inch: Cast iron hook.
- E. Wall Support for Pipe Sizes 4 inch and over: Welded steel bracket and wrought steel clamp; adjustable steel yoke and cast iron roll for hot pipe sizes 6 inch and over.
- F. Vertical Support: Steel riser clamp.
- G. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- H. Shield for Insulated Piping 2 inch and smaller: 18 gage galvanized steel shield over insulation in 180 degree segments, minimum 12 inch long at pipe support.
- I. Shield for Insulated Piping 2-1/2 inch and larger (Except Cold Water Piping): Pipe covering protective saddles.
- J. Shields for Cold Water Piping 2-1/2 inch and larger: Hard block non-conducting saddles in 90 degree segments, 12 inch minimum length, block thickness same as insulation thickness.
- K. Cast Iron pipe shall be supported at every joint and at a maximum of 5 feet between supports.

#### 2.3 HANGER RODS

A. Steel Hanger Rods: Threaded both ends, threaded one end, or continuous threaded (minimum size 3/8 inch diameter, see paragraph 3.01 herein), as required.

#### 2.4 SLEEVES

- A. Sleeves for Pipes Through Non-fire Rated Floors: Form with 18 gauge galvanized steel.
- B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Form with steel pipe or 18 gauge galvanized steel. All pipe sleeves shall be 2 standard sizes larger than the pipe being used.

- C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Prefabricated fire rated sleeves including seals, UL listed.
- D. Sleeves for Ductwork: Form with galvanized steel.
- E. Stuffing or Fire Stopping Insulation: Glass fiber type, non-combustible, cover with fire barrier caulk.
- F. Caulking and Sealants
  - 1. All penetrations thru non-fire and fire rated walls and assemblies shall be sealed with 3M-Fire Barrier Caulk # CP25WB and/or 3M-Fire Barrier # FS-195 plus wrap/strip or, an approved equal, meeting the requirements of ASTM-E-814 and ANSI/UL1479, as shown on the drawings.

### 2.7 FLASHING

- A. Metal Flashing: 26 gauge galvanized steel.
- B. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.
- C. Caps; Steel, 22 gauge minimum; 16 gauge at fire resistant elements.

#### 2.8 FABRICATION

- A. Size sleeves large enough to allow from movement due to expansion and contraction, two standard sizes larger than the pipe passing through. Provide for continuous insulation wrapping.
- B. Design hangers without disengagement of supported pipe.
- C. Provide copper plated hangers and supports for copper piping.

### 2.9 FINISH

A. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

#### PART 3 - EXECUTION

#### 3.1 PIPE HANGERS AND SUPPORTS

- A. All piping shall be supported from the building structure by means of approved hangers and supports similar to B-line, Miro Industries Inc, or equivalent. Piping shall be supported to maintain required grading pitching of lines, to prevent vibration and to secure piping in place, and shall be so arranged as to provide for expansion and contraction. Chain, perforated strap, bar, or wire hangers are not permitted.
  - 1. Work shall not be supported by or from other trades such as Electrical, HVAC, and any work done under this division. Work, however, may be supported by or from a trapeze or similar type support that may be common for all trades.
  - 2. There shall be no direct contact between dissimilar metals. Coordinate with hanger manufacturer.
- B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
- C. Place a hanger within 12 inch of each horizontal elbow.
- D. Use hangers with 1-1/2 inch minimum vertical adjustment.
- E. Support vertical piping at every deck penetration. Support vertical cast iron pipe at each floor at hub.
- F. Where several pipes can be installed in parallel and at same elevation, provide multiple supports or trapeze hangers.
- G. Support riser piping independently of connected horizontal piping.
- H. Piping shall not be hung from other piping, ducts, conduits, equipment or items installed by other trades. Hanger rods shall not pierce ductwork.
- I. Provide protection shields and saddles at supports with insulated or covered piping.
- J. At no time will piggy backing of supports be permitted.

K. Where codes having jurisdiction requiring closer spacing, the hanger spacing shall be as required by code in lieu of the distances required herein.

### 3.2 PENETRATIONS

- A. Set sleeves in position in formwork. Provide reinforcing around sleeves. Core drill as required when slabs are in place.
- B. Extend sleeves through floors one inch above finished floor level. Caulk sleeves full depth with fire resistant caulk and provide floor plate.
- C. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between sleeve and pipe or duct and adjacent work with fire stopping insulation and fire stopping caulk seal. See paragraph 2.07 herein. Provide close fitting metal collar or escutcheons covers at both sides of penetration.
- D. Install chrome plate steel or stainless steel escutcheons with set screws at finished surfaces. Where piping is insulated the escutcheons shall be outside the insulation.
- Joints, seams or penetrations in the building envelope, Ε. that are sources of air leakage, shall be sealed with durable caulking materials, closed with gasketing systems, taped or covered with moisture vapor-permeable house-wrap. Sealing materials spanning joints between dissimilar construction materials shall allow differential expansion and contraction of construction materials. This includes sealing around tubs and showers, at the attic and crawl space panels, at recessed lights and around all plumbing and electrical penetrations. These are openings located in the building envelope between conditioned space and unconditioned space or between the conditioned space and the outside.

## 3.3 FLASHING

A. Provide flexible flashing and metal counter flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

- B. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms, installed in accordance with manufacturer's instructions for sound control.
- C. Provide manufacturers curbs for mechanical roof installations 12 inch minimum high above roofing surface unless otherwise noted. See paragraph 2.06 A herein. Flexible sheet flash and counter flash with sheet metal; seal watertight.

++ END OF SECTION ++

#### SECTION 15290

#### DUCTWORK INSULATION

## PART 1 - GENERAL

#### 1.1 GENERAL

A. The General Provisions of the Contract, including General and Supplementary General Conditions and Division 1 General Requirements, apply to the work specified in this Section.

#### 1.2 WORK INCLUDED

- A. Furnish all labor, equipment, materials and accessories, and perform all operations required, for the correct fabrication and installation of thermal insulation applied in accordance with applicable project specifications and drawings, subject to the terms and conditions of the contract.
- B. Ductwork insulation.
- C. Insulation jackets.

## 1.3 REFERENCES

- A. ANSI/ASTM C553 Mineral Fiber Blanket and Felt Insulation.
- B. ANSI/ASTM C612 Mineral Fiber Block and Board Thermal Insulation.
- C. ASTM E84 Surface Burning Characteristics of Building Materials.
- D. NFPA 255 Surface Burning Characteristics of Building Materials.
- E. UL 723 Surface Burning Characteristics of Building Materials.
- F. UL 181-Pressure Sensitive Tape

## 1.4 QUALITY ASSURANCE

- A. Applicator: Company specializing in ductwork insulation application with three years minimum experience. Insulation materials and accessories shall be installed in a workmanlike manner by skilled and experienced workers who are regularly engaged in commercial insulation work.
- B. Insulation materials and accessories furnished and installed hereunder shall, where required, be accompanied by manufacturer's current submittal or data sheets showing compliance with applicable specifications.
- C. Materials: UL listed; flame spread/fuel contributed/smoke developed rating of 25/-/50 in accordance with NFPA 255, UL 723.

#### 1.5 SUBMITTALS

- A. Submit product data in accordance with Section 15011.
- B. Include product description, list of materials and thickness for each service, and locations.
- C. Submit manufacturer's installation instructions.

#### 1.6 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesive and insulation.

#### 1.7 DELIVERY AND STORAGE OF MATERIALS

- A. All of the insulation materials and accessories covered by this specification shall be delivered to the job site and stored in a safe, dry place with appropriate labels and/or other product identification.
- B. The contractor shall use whatever accepted means to protect the insulation materials and accessories before, during, and after installation. No insulation material shall be installed that has become damaged in any way. The contractor shall also use accepted means necessary to protect the work and materials of other trades.

C. If any insulation material has become wet because of transit or job site exposure to moisture or water, the contractor shall not install such material, and shall remove it from the job site. An exception may be allowed in cases where the contractor is able to demonstrate that wet insulation when fully dried out before installation will provide installed performance that is equivalent in all respects to new, completely dry insulation.

#### PART 2 - PRODUCTS

#### 2.1 ACCEPTABLE MANUFACTURERS

- A. Johns Manville.
- B. Knauf.
- C. Owens Corning.

### 2.2 MATERIALS

- A. Type A: Flexible glass fiber; ANSI/ASTM C612; commercial grade; 'k' value of 0.29 maximum at 75 degrees F; foil scrim facing for air conditioning ducts. Vapor barrier shall be legibly printed by the manufacturer to show nominal thickness, R-valve and type of insulation. Knauf Duct Wrap with Commercial Foil Skrim (FCK) .75PCF.
- B. Type B: Rigid glass fiber; ANSI/ASTM C612, Class 1; "k" value of 0.24 maximum at 75 degrees F; 0.002 inch foil scrim facing for air conditioning ducts. Knauf Air Duct.
- C. Interior duct insulation is not acceptable.
- D. R-Value identification marks are to be in maximum intervals of 10 feet.

#### 2.3 ACCESSORIES

- A. Adhesives: UL approved waterproof fire-retardant type.
- B. Indoor Jacket: 6 oz./sq. yd. canvas. Pre-sized glass cloth, minimum 7.8 oz./sq. yd.
- C. Outdoor Jacket: Coated glass fiber sheet, 30 lb./sq. yd.

- D. Lagging Adhesive: Fire resistive to NFPA 255, UL 723.
- E. Impale Anchors: Galvanized steel, 12 gage, self-adhesive pad.
- F. Joint Tape: Glass fiber cloth, open mesh, UL 181A or UL181B.
- G. Tie Wire: Corrosion resistant, Annealed steel, 16 gauge.

#### PART 3 - EXECUTION

#### 3.1 SITE INSPECTION

- A. Before starting the work under this section, carefully inspect the site and installed work of the other trades and verify that such work is complete to the point where installation of materials and accessories under this section can begin.
- B. Verify that all materials and accessories can be installed in accordance with the project drawings and specifications and material manufacturer's recommendations.
- C. Verify, by inspecting product labeling, submittal data, and/or certifications which may accompany the shipments, that all materials and accessories to be installed on the project comply with the applicable specifications and standards and meet specified thermal and physical properties.

## 3.2 PREPARATION

- A. Install materials after ductwork has been tested and approved.
- B. Ensure that all surfaces over which insulation is to be installed are clean and dry.
- Ensure that insulation is clean, dry, and in good mechanical condition with all factory applied vapor or weather barriers intact and undamaged. Wet, dirty, or damaged insulation shall not be acceptable for installation.

## 3.3 INSTALLATION

#### A. General:

- 1. Ductwork dimensions indicated are net inside dimensions required for air flow.
- 2. Before installing insulation, ensure that all seams and joints in the ductwork have been sealed.
- 3. Install materials in accordance with manufacturer's instructions, recommendations and all governing codes and regulations.
- 4. Install insulation materials with smooth and even surfaces. Butt joints firmly together to ensure complete and tight fit over surfaces to be covered.
- 5. Maintain the integrity of factory applied vapor barrier jacketing on all insulation, protecting it against puncture, tears, or other damage. All staples used on cooling or dual temperature ductwork insulation shall be coated with suitable sealant to maintain vapor barrier integrity.
- 6. All insulation exposed to the weather shall contain a protective finish or jacketing as recommended by the insulation manufacturer.
- 7. All supply and return ductwork conveying interior air that passes through unconditioned spaces within the building envelope shall be insulated to a minimum of R-6 and be sealed by exterior vapor barrier with a continuous sealed seam.
- 8. All supply and return ductwork conveying interior air that passes through conditioned spaces shall be insulated to a minimum of R-3.5 and be sealed by exterior vapor barrier with a continuous sealed seam.

Exception: Where the design temperature difference between the interior and exterior of the duct or plenum is not greater than  $15\,^{\circ}\text{F}$ 

- 9. All supply and return ductwork from rooftop units are to be insulated.
- 10. Insulation shall be installed in a manner that permits inspection of the manufacturer's R-value identification mark.
- 11. Ducts outside of building envelope shall be insulated to a minimum of R-8 and wrapped in accordance with section C below.
- B. Provide insulation with vapor barrier when air conveyed may be below ambient temperature.
- C. Exterior Insulation (Type A or Type B) Application:
  - 1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
  - 2. Secure insulation without vapor barrier with staples, tape, or wires.
  - 3. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive or pressure sensitive tape matching the facing. Tapes shall be listed and labeled in accordance with UL 181A or UL 181B. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
  - 4. Where ducts are 24 inch in width or greater, mechanical fasteners spaced at 18 inch centers are required on the bottom of the duct to prevent the insulation from sagging.
  - 5. Exterior ductwork shall be wrapped in EPDM membrane, metallic or UV-resistant plastic jacketing, or other approved weather and UV resistant protective method.

## D. Plenum Application:

1. Secure insulation to exterior surface of plenum in accordance with paragraph C above.

- 2. R values of insulation shall be in accordance with paragraph 3.03 part A-6, A-7, and A-10. herein.
- E. Continue insulation with vapor barrier through penetrations as shown on the drawings.
- F. All insulation of access doors shall be set in sheet metal double pan construction.

## 3.4 FIELD QUALITY ASSURANCE

A. Upon completion of all insulation work covered by this specification, visually inspect the work and verify that it has been correctly installed. This may be done while work is in progress, to assure compliance with the requirements herein to cover and protect insulation materials during installation.

## 3.5 PROTECTION

A. Replace damaged insulation, which cannot be satisfactorily repaired, as determined by the Engineer, including insulation with vapor barrier damage and moisture saturated insulation.

++ END OF SECTION ++



#### SECTION 15820

### IDENTIFICATION FOR HVAC EQUIPMENT

#### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. Scope: Provide identification labels for all HVAC equipment, devices, piping, and ductwork installed under this contract, as specified herein.
- B. 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. Equipment labels.
  - 2. Warning signs and labels.
  - 3. Duct labels.
  - 4. Piping labels.
  - 5. Valve Tags.
  - 6. Stencils.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

#### 1.4 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

#### PART 2 - PRODUCTS

## 2.1 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:
  - Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
  - 2. Letter Color: White.
  - 3. Background Color: Black.
  - 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
  - 5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
  - 6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
  - 7. Fasteners: Stainless-steel rivets.
  - 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

- B. Label Content: Include equipment's number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

#### 2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: White.
- C. Background Color: Red.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions.

## 2.3 DUCT LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Black.
- C. Background Color: White.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.
  - 1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
  - 2. Lettering Size: At least 1-1/2 inches high.

## 2.4 PIPING LABELS

A. All service piping which is accessible for maintenance operations shall be identified with snap-on or wrap-around semi-rigid plastic (not pressure-sensitive adhesive) identification markers. Direction of flow arrows are to be included on each marker, unless otherwise directed.

- B. In conformance with "Scheme for the Identification of Piping Systems" (ANSI/ASME A13.1), each marker must show approved color-coded background, proper color of legend in relation to background color, approved legend letter size, and approved marker length.
- C. Pipe marking methods shall be of the following:
  - 1. SETMARK Snap-On or SETMARK Strap-on markers
  - 2. W.H. Brady pipe markers
  - 3. Engraved and enamel-filled brass tags attached with brass chain
  - 4. Stencils as per section 2.6 herein.
  - 5. Other methods approved by the Engineer
- D. Locations for pipe markers and identification tags are as follows:
  - 1. Adjacent to each valve and fitting.
  - 2. At each branch and riser take off.
  - 3. At each pipe passage through walls, floors, or ceilings, on both sides of the penetration.
  - 4. On all straight pipe runs every 25 feet.
  - 5. Apply markers on the two lower quarters of overhead pipe and where view is not obstructed.

#### 2.5 VALVE TAGS

- A. All valves shall be identified with the appropriate service designation and valve number designation on 2-inch wide, 19-gauge brass tags.
  - 1. Water valves: Round tag with 1/4 inch black-filled letters over 1/2 inch black-filled numbers.
  - 2. Gas valves: Octagonal tag with 1/4 inch black-filled letters over 1/2 inch black-filled numbers.

- B. Tags shall be fastened to valves with meter seals, brass "S" hooks, or brass jack chain. Brass tags and fasteners shall be manufactured by Seton Identification Products or equal.
- C. Charts of all valves, new and existing throughout the building, shall be furnished in duplicate by the Contractor, said charts to include the following items:
  - 1. Valve Identification Number.
  - 2. Location.
  - 3. Purpose.

One chart to be mounted in a frame and secured on a wall in a location as directed by the client. A second chart to be prepared and provided in a plastic protective envelope. Valve charts, frames, and envelopes to be manufactured by Seton Identification Products or equal.

### 2.6 STENCILS

- A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4 inches for ducts; and minimum letter height of 3/4 inch for access panel and door labels, equipment labels, and similar operational instructions.
  - 1. Stencil Material: Aluminum.
  - 2. Stencil Paint: Exterior, gloss, alkyd enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
  - 3. Identification Paint: Exterior, alkyd enamel in colors according to ASME A13.1 unless otherwise indicated.

## PART 3 - EXECUTION

## 3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including

dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

## 3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

#### 3.3 DUCT LABEL INSTALLATION

- A. Install self adhesive duct labels with permanent adhesive on air ducts in the following color codes:
  - 1. Green: For exhaust ducts.
- B. Stenciled Duct Label Option: Stenciled labels, showing service and flow direction, may be provided instead of plastic-laminated duct labels, at Installer's option, if lettering larger than 1 inch high is needed for proper identification because of distance from normal location of required identification.

+ + END OF SECTION + +



## ELECTRIC DUCT HEATERS

## PART 1 GENERAL

#### 1.1 GENERAL

A. The General Provisions of the Contract apply to the work specified in this Section.

#### 1.2 SCOPE OF WORK

A. The contactor shall furnish and install Unit Heaters as supplied by Indeeco or equal as shown and as scheduled on the drawings, with required mounting components and accessories.

#### PART 2 PRODUCTS

#### 2.1 FRAME AND TERMINAL BOX

- A. Heater frames and terminal boxes shall be corrosion resistant steel and shall be provided with a hinged, latching cover and multiple concentric knockouts for field wiring.
- B. Unless otherwise indicated, the terminal box shall be NEMA 1 type construction.

## 2.2 SAFETY CUTOUTS

- A. Heaters shall be furnished with a disc type, automatic reset thermal cutout for primary overtemperature protection.
- B. Heaters shall be furnished with disc type, load-carrying manual reset thermal cutouts, factory wired in series with heater stages for secondary protection.
- Heat limiters or other fusible overtemperature devices are not acceptable.
- D. Duct heater shall have factory installed and wired air flow switch to prevent heating element operation without

sufficient air flow. Air flow switch shall be of differential pressure type.

## 2.3 ELEMENT

- A. Heating elements shall be open coil, 80% nickel, 20% chromium, Grade A resistance wire. Type C alloys containing iron or other alloys are not acceptable.
- B. Coils shall be machine crimped into stainless steel terminals extending at least 1" into the airstream and all terminal hardware shall be stainless steel.
- C. Coils shall be supported by ceramic bushings staked into supporting brackets.

#### 2.4 ELECTRICAL

- A. Heaters shall be rated for the voltage, phase, and number of heating stages indicated in the schedule. All three-phase heaters shall have equal, balanced, three-phase stages.
- B. All internal wiring shall be stranded copper with 105°C insulation and shall be terminated in crimped connectors or box lugs.
- C. Terminal blocks shall be provided for all field wiring and shall be sized for installation of 75°C copper wire, rated in accordance with NEC requirements.

#### PART 3 EXECUTION

## 3.1 INSTALLATION

A. Install in accordance with the manufacturer's instructions and the drawings.

#### 3.2 SUBMITTALS

A. Submittals shall be in accordance with Section 15011.

#### 3.3 OPERATION AND MAINTENANCE MANUAL

A. Operation and Maintenance Manual shall be in accordance with Section 15011 paragraph 1.4.

+ + END OF SECTION + +

## VENTILATION EQUIPMENT

#### PART 1 - GENERAL

## 1.1 DESCRIPTION

- A. Scope: The Mechanical Contractor shall furnish all labor, tools, materials, and equipment necessary for providing ventilation fans and accessories as required for a complete installation, as shown and scheduled on drawings and specified herein.
- B. Related Work Specified Elsewhere:
  - 1. Section 15860, Louvers.

## 1.2 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable provisions and recommendations of the following:
  - 1. Underwriters Laboratory (UL705)
  - 2. AMCA Standard 210
  - 3. AMCA Standard 300

#### 1.3 SUBMITTALS

- A. Shop Drawings: Submit for approval shop drawings showing the following:
  - 1. Manufacturer's catalog data including materials, design, performance and dimensional information.
  - 2. Manufacturer's published performance curve.
  - 3. List of options and accessories with catalog data.
  - 4. Manufacturer's installation instructions.
- B. Test and Certifications:
  - 1. Manufacturer's Certifications.

Manufacturer's 1-year warranty.

## 1.4 MANUFACTURER'S SERVICES

- A. Certifications: The manufacturer shall provide the following certifications:
  - Certification that equipment meets the general intent of the specifications and list of all deviation from specifications.
  - 2. Certification that equipment has been installed properly.
- B. Manufacturer shall furnish all shop drawings and information as requested by the Engineer.
- C. Manufacturer shall provide three copies of instructions for operating, maintaining and lubricating.
- D. Manufacturer shall provide a 1-year supply of all necessary lubricants.
- E. Manufacturer shall provide a 1-year warranty against defects in parts or workmanship.

## 1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery of Materials: All materials shall be inspected for conformance with approved Shop Drawings.
- B. Storage of Materials: All materials shall be stored in the original shipping cartons in a dry location until time of installation.

## PART 2 - PRODUCTS

## 2.1 INLINE CENTRIFUGAL EXHAUSTER - DIRECT DRIVE

- A. Direct-drive inline exhausters shall be centrifugal type as listed in the fan schedule.
- B. Construction: Unit exterior shall be constructed of galvanized steel sheet over rigid frame. The fan housing shall be square in shape and readily attachable to

building ductwork. Unit side panels shall be removable for easy access for maintenance and service. Fan housings shall have universal mounting brackets to accommodate horizontal or vertical installations. Fans shall bear a permanent attached nameplate displaying model and serial number of the unit for future identification.

- C. Wheel: Fan wheels shall be of the non-overloading centrifugal backward inclined type, constructed of aluminum and containing a matching, overlapping inlet venturi for optimum unit performance. Wheels shall be statically and dynamically balanced.
- D. Drive: Direct drive coupling of motor shaft to fan wheel shall be made with a machined aluminum hub mounted onto the backplate of the fan wheel. Hub shall be line bored to eliminate the need for bushings.
- E. Motor: Motors shall be of open construction, NEMA B, and closely matched to the fan load. A disconnect switch shall be factory installed and wired to the fan motor as standard. Motor shall be isolated from the airstream. All motors shall be UL recognized.

## F. Manufacturer:

- 1. Inline Centrifugal Exhausters Belt Drive.
  - a. Greenheck Fan Corp.
  - b. American Coolair Corp.
  - c. Or approved equal.

## 2.2 MANUAL SPEED CONTROLLER

- A. Variable speed output.
- B. Speed selector (minimum to maximum) with "Off" position.
- C. Input: 115/230 volt.
- D. Output: 10 amp inductive.
- E. Fuse for overload protection.
- F. PVC non-corrosive enclosure.

- G. Product and manufacturer:
  - 1. Vostermans Varifan MVS-1C.
  - 2. Or approved equal.

## PART 3 - EXECUTION

## 3.1 GENERAL

- A. Coordinate wall openings with fan dimensions.
- B. Install mounting hardware as recommended by manufacturer.
- C. Expanded metal (galvanized) shall be used as additional reinforcement. Reinforcement shall be placed between the weather hood and fan on all fans, and on the interior of all louvers.

## 3.2 INSTALLATION

- A. Install all fans and accessories according to manufacturer's recommendations and instructions.
- B. Obtain manufacturer's written installation certification.

## 3.3 COORDINATION

- A. The Contractor shall verify the dimensions and weights of the proposed ventilation equipment and accessories and provide appropriate support hardware.
- B. It is the Contractor's responsibility to verify condition and location of structure the equipment is to be mounted to and notify the Architect of any adjustments or relocation that may be necessary prior to ordering materials or fabricating or installing components. Deviations from the contract documents made without written approval from the Architect and subsequently found to be unacceptable shall be corrected at the contractor's sole expense.

+ + END OF SECTION + +

## **LOUVERS**

#### PART 1 - GENERAL

## 1.1 DESCRIPTION

- A. Scope: The Mechanical Contractor shall furnish all labor, tools, materials, and equipment necessary for providing louvers and accessories as required for a complete installation, as shown and scheduled on drawings and specified herein.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## 1.2 SUBMITTALS

- A. Shop Drawings: Submit for approval Shop Drawings showing the following:
  - 1. Manufacturer's catalog data including materials, design, performance and dimensional data.
  - List of options and accessories furnished with louver along with respective catalog data.
  - 3. Manufacturer's installation instructions.

## B. Certifications:

- 1. Manufacturer's Certifications.
- 2. Manufacturer's 1-year warranty.

## 1.3 MANUFACTURER'S SERVICES

- A. Certifications: The manufacturer shall provide the following certifications:
  - 1. Certification that the equipment meets the general intent of the specifications and a list of all deviations from specifications.

- 2. Certification that equipment has been installed properly.
- B. Manufacturer shall furnish all shop drawings and information as requested by the Engineer.
- C. Manufacturer shall provide a 1-year warranty against defects in parts and workmanship.

## 1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery of Materials: All materials shall be inspected for conformance with approved Shop Drawings.
- B. Storage of Materials: All materials shall be stored in the original shipping cartons in a dry location until time of installation.

#### PART 2 - PRODUCTS

#### 2.1 ADJUSTABLE LOUVERS

- A. Adjustable louvers shall be designed to protect air intake in building exterior walls. All adjustable louvers shall be motorized.
- B. The louver frames shall be the channel type fabricated from 6063-T5 aluminum. Frames shall be 4 inches deep.
- C. The adjustable blades shall be of drainable design and fabricated from 6063-T5 aluminum.
- D. The linkage shall be exposed on-blade linkage.
- E. All louvers shall be furnished with a bird screen.
- F. The motorized actuators shall be 120 Volts, internally mounted and shall fail in the closed position (power open, spring closed).
- G. All louvers shall be sized as shown on the drawings and as specified in the louver schedule.

- H. All louvers shall receive a 1.2-mil Kynar finish in a color as selected by the Owner from the manufacturer's color charts.
- I. Louvers shall be designed to withstand wind loadings of 16 pounds per square foot or 80 mph.
- J. Manufacturer:
  - 1. Greenheck, Model ECD-401
  - 2. Or equal.

## PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Install all louvers and accessories in accordance with the manufacturer's recommendations and published instructions.
- B. Obtain manufacturer's written installation certification.

+ + END OF SECTION + +



## DUCTWORK

## PART 1 - GENERAL

#### 1.1 GENERAL

- A. Scope: Provide and install fabricated sheetmetal ductwork as shown and scheduled on drawings and specified herein.
- B. The General Provisions of the Contract, including General and Supplementary General Conditions and Division 1 General Requirements, apply to the work specified in this Section.

## 1.2 SQUARE/RECTANGULAR DUCTWORK

- Α. Construct ductwork and casings in accordance with the mechanical code of N.Y.S. and with appropriate portions of the Low Velocity and Duct Construction standard of the Sheet Metal and Air Conditioning Contractor's National Association. Ducts shall be constructed of galvanized steel sheets in accordance with ASTM-A525. Zinc coating shall not be less than 1.25 ounces per square foot. Elbows shall be long radius or vaned. Seams and joints shall be tightly secured to stiffen the duct and to prevent air leakage. Leakage shall be less than five (5) percent of a fan scheduled capacity. Tape all transverse seams in supply ducts. Every effort shall be made by the Contractor to reduce leakage to the 5% maximum. Contractor shall submit detailed drawings showing the proposed construction, including joints, bracing, dimensions, and hanger types. Fabrication shall not start until the details are approved. leaks shall be sealed to maintain the above minimum requirements.
- B. Ducts shall be suspended by means of galvanized steel straps, minimum 1 inch x 16 gauge and be securely fastened to the structure and equipment. Ducts shall not be suspended from corrugated flooring or roofing.
- C. Square 90° ductwork turns are to be avoided wherever possible but, if used, shall come equipped with 90°

turning vanes of galvanized steel with all mounting equipment, etc. for a proper installation.

- D. Flexible aluminum ductwork is not acceptable.
- E. All ductwork conveying interior air, that passes through an unheated space, or conveying unconditioned outside air within a conditioned space, shall be insulated to a <a href="MINIMUM">MINIMUM</a> of R6, and be sealed by exterior vapor barrier with a continuously sealed seam and shall include classroom and bathroom exhaust.

## 1.3 ROUND DUCTWORK

#### A. General

- The contractor may, at his option, convert any or all rectangular ductwork to round, provided that the project space limitations are properly addressed, the overall system design static pressure is not exceeded, and the insulation requirements are met.
- 2. All round supply, return and exhaust ductwork shall be SPIROsafe® as manufactured by Lindab, Inc (800) 797-7476 or approved equal. The duct system shall consist of fittings that are factory fitted with a sealing gasket and spiral duct which, when installed according to the manufacturer's instructions, will seal the duct joints without the use of duct sealer.

#### B. Materials

1. Unless otherwise noted, all duct and fittings shall be a minimum of G-90 galvanized steel in accordance with ASTM A-653 and A-924.

#### C. Construction

1. Unless otherwise noted, all duct and fittings shall be constructed per SMACNA's Duct Construction Standards (+10 in W.G.)

## D. Fittings

1. All fitting ends shall come factory equipped with a double lipped, U-profile, EPDM rubber gasket.

Gasket shall be manufactured to gauge and flexibility so as to insure that system will meet all of the performance criteria set forth in the manufacturer's literature. Gasket shall be classified by Underwriter's Laboratories to conform to ASTM E-84-91a and NFPA 90A flame spread and smoke developed ratings of 25/50.

- 2. All fitting ends shall be calibrated to manufacturer's published dimensional tolerance standard and associated spiral duct.
- 3. All fitting ends from 3 inch to 24 inch diameter shall have rolled over edges for added strength and rigidity.
- 4. All elbows from 3 inch to 12 inch diameter shall be 2 piece die stamped and continuously stitch welded. All elbows 14 inch diameter and larger shall be standing seam gorelock construction and internally sealed.
- 5. The radius of all 90° and 45° elbows shall be 1.5 times the elbow diameter, unless otherwise noted on the drawings.
- 6. All fittings that are of either spot welded or button punched construction shall be internally sealed. When contract documents require divided flow fittings, only full body fittings will be accepted. The use of duct taps is unacceptable except for retrofit installations.
- 7. All volume dampers shall be SPIROsafe type DRU, DSU or DTU or approved equal. Damper shall be fitting sized to slip into spiral duct. Damper shall have the following features:
  - a. Locking quadrant with blade position indicator.
  - b. 2 inch sheet metal insulation stand-off
  - c. Integral shaft/blade assembly
  - d. Shaft mounted, load bearing sintered bronze bushings

e. Gasketed shaft penetrations to minimize leakage

## E. Spiral Duct

- 1. Spiral duct shall be calibrated to manufacturer's published dimensional tolerance standard.
- 2. All spiral duct 14 inch diameter and larger shall be corrugated for added strength and rigidity.
- 3. Spiral seam slippage shall be prevented by means of a flat seam and a mechanically formed indentation evenly spaced along the spiral seam.

#### F. Performance

1. Duct system performance shall meet SMACNA's Leakage Class 3 requirements at the system design static pressure as indicated on the contract documents not to exceed -20 in W.G. or +12 in W.G.

## G. Open Ended Ductwork

1.  $\underline{\text{All}}$  open ended ductwork  $\underline{\text{must}}$  be closed at all times after installation.

#### H. Submittals

1. Submittals are to be in accordance with Section 15011.

++ END OF SECTION ++

# TESTING, ADJUSTING, AND BALANCING FOR HVAC

#### PART 1 - GENERAL

## 1.1 DESCRIPTION

- A. Scope: Provide labor and equipment to perform testing and balancing services, and provide certified balancing reports, as specified herein.
- B. 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. Procedures for Constant volume air systems

## 1.3 DEFINITIONS

- A. TAB: Testing, adjusting, and balancing.
- B. TABB: Testing, Adjusting, and Balancing Bureau.
- C. TAB Specialist: An entity engaged to perform TAB Work.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within 10 business days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Certified TAB reports.
- C. Instrument calibration reports, to include the following:
  - 1. Instrument type and make.

- 2. Serial number.
- 3. Application.
- 4. Dates of use.
- 5. Dates of calibration.

## 1.5 QUALITY ASSURANCE

- A. TAB Contractor Qualifications: Engage a TAB entity certified by TABB.
  - 1. TAB Field Supervisor: Employee of the TAB contractor and certified by TABB.
  - 2. TAB Technician: Employee of the TAB contractor and who is certified by TABB as a TAB technician.
- B. Certify TAB field data reports and perform the following:
  - 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
  - 2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.
- C. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."
- D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 "Air Balancing."
- E. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 "System Balancing."

## 1.6 PROJECT CONDITIONS

A. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

## 1.7 COORDINATION

- A. Notice: Provide five business days' advance notice for each test. Include scheduled test dates and times.
- B. Perform TAB after leakage and pressure tests on air exhaust systems have been satisfactorily completed.

## PART 2 - PRODUCTS (Not Applicable)

## PART 3 - EXECUTION

#### 3.1 TAB SPECIALISTS

- A. Subject to compliance with requirements, engage one of the following available TAB contractors that may be engaged include, but are not limited to, the following:
  - 1. Precision Tab Services, Inc.
  - 2. PC Testing and Balancing

## 3.2 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
- B. Examine the approved submittals for HVAC systems and equipment.
- C. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- D. Examine test reports specified in individual system and equipment Sections (where specified).
- E. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

- F. Examine operating safety interlocks and controls on HVAC equipment.
- G. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

## 3.3 PREPARATION

- A. Prepare a TAB plan that includes strategies and stepby-step procedures.
- B. Complete system-readiness checks and prepare reports. Verify the following:
  - 1. Permanent electrical-power wiring is complete.
  - 2. Automatic/programmable temperature-control systems are operational.
  - 3. Equipment and duct access doors are securely closed.
  - 4. Balance and volume dampers are open.
  - 5. Windows and doors can be closed so indicated conditions for system operations can be met.

## 3.4 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance"
  - Comply with requirements in ASHRAE 62.1, Section
     7.2.2 "Air Balancing."
- B. Cut insulation and ducts for installation of test probes to the minimum extent necessary for TAB procedures.
  - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.

- 2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 15890 "Ductwork."
- 3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to material specifications.
- C. Mark equipment and balancing devices, including dampercontrol positions, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound.

## 3.5 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- D. Check airflow patterns from the outdoor-air louvers/dampers.
- E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- F. Verify that motor starters are equipped with properly sized thermal protection.
- G. Check dampers for proper position to achieve desired airflow path.
- H. Check for airflow blockages.
- I. Verify that air duct system is sealed as specified in Section 15890 Ductwork.

#### 3.6 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to exhaust total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
  - 1. Measure total airflow.
    - a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.
  - 2. Measure fan static pressures as follows to determine actual static pressure:
    - a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
    - b. Measure static pressure directly at the fan outlet or through the flexible connection.
  - 3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
  - 4. Obtain approval from Engineer.
  - 5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors.
- B. Adjust volume dampers for main duct, and branch ducts to indicated airflows within specified tolerances.
  - 1. Measure airflow of submain and branch ducts.
    - a. Where sufficient space in branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal inlets and calculate the total airflow for that branch.

- 2. Measure static pressure at a point downstream from damper, and adjust volume dampers until the proper static pressure is achieved.
- 3. Remeasure each branch duct after all have been adjusted. Continue to adjust branch ducts to indicated airflows within specified tolerances.
- C. Adjust air inlets for the room indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.
  - Adjust each intlet in the room to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.

## 3.7 TOLERANCES

- A. Set HVAC system's air flow rates within the following tolerances:
  - 1. Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
  - 2. Air Inlets: Plus or minus 10 percent.

## 3.8 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems to allow access for performance measuring and balancing devices.

## 3.9 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

- 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
- 2. Include a list of instruments used for procedures, along with proof of calibration.
- B. Final Report Contents: In addition to certified field-report data, include the following:
  - 1. Fan curves.
  - 2. Manufacturers' test data.
  - 3. Field test reports prepared by system and equipment installers.
  - 4. Other information relative to equipment performance; do not include Shop Drawings and product data.
- C. General Report Data: In addition to form titles and entries, include the following data:
  - 1. Title page.
  - 2. Name and address of the TAB contractor.
  - 3. Project name.
  - 4. Project location.
  - 5. Architect's name and address.
  - 6. Engineer's name and address.
  - 7. Contractor's name and address.
  - 8. Report date.
  - 9. Signature of TAB supervisor who certifies the report.
  - 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.

- 11. Summary of contents including the following:
  - a. Indicated versus final performance.
  - b. Notable characteristics of systems.
  - c. Description of system operation sequence if it varies from the Contract Documents.
- 12. Nomenclature sheets for each item of equipment.
- 13. Notes to explain why certain final data in the body of reports vary from indicated values.
- 14. Test conditions for fans and pump performance forms including the following:
  - a. Settings for outdoor dampers.
  - b. Fan drive settings including settings and percentage of maximum pitch diameter.
- D. Fan Test Reports: For exhaust fans, include the following:
  - 1. Fan Data:
    - a. System identification.
    - b. Location.
    - c. Make and type.
    - d. Model number and size.
    - e. Manufacturer's serial number.
    - f. Arrangement and class.
  - 2. Motor Data:
    - a. Motor make, and frame type and size.
    - b. Horsepower and rpm.
    - c. Volts, phase, and hertz.

- 3. Test Data (Indicated and Actual Values):
  - a. Total airflow rate in cfm.
  - b. Total system static pressure in inches wg.
  - c. Fan rpm.
  - d. Discharge static pressure in inches wg.
  - e. Suction static pressure in inches wg.
- E. Round Duct Reports: Include a diagram with a grid representing the duct cross-section and record the following:
  - 1. Report Data:
    - a. System and fan number.
    - b. Location.
    - c. Duct static pressure in inches wg.
    - d. Duct size in inches.
    - e. Duct area in sq. ft..
    - f. Indicated air flow rate in cfm.
    - g. Indicated velocity in fpm.
    - h. Actual air flow rate in cfm.
    - i. Actual average velocity in fpm.
- F. Instrument Calibration Reports:
  - 1. Report Data:
    - a. Instrument type and make.
    - b. Serial number.
    - c. Application.
    - d. Dates of use.
    - e. Dates of calibration.

## 3.10 INSPECTIONS

## A. Initial Inspection:

- 1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
- 2. Check the following for each system:
  - a. Measure airflow of at least 10 percent of air outlets.
  - b. Verify that balancing devices are marked with final balance position.
  - c. Note deviations from the Contract Documents in the final report.

## B. Final Inspection:

- 1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Owner.
- 2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Owner and shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
- 3. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
- 4. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and

balancing shall be considered incomplete and shall be rejected.

- C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:
  - 1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
  - 2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.
- D. Prepare test and inspection reports.

## 3.11 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

+ + END OF SECTION + +

# DIVISION 16 - ELECTRICAL



## GENERAL PROVISIONS

#### PART 1 - GENERAL

## 1.1 DESCRIPTION

- A. Scope: Contractor shall furnish all labor, materials, equipment and incidentals required to complete the electrical work as shown and specified. The scope of work includes the following:
  - 1. Furnish and install primary electrical service from existing O&R riser pole to the new padmounted transformer, including O&R coordination.
  - 2. Furnish and install a new 208/120 volt electrical service to the new main distribution panelboard in the Senior Center.
  - 3. Furnish and install power distribution equipment, such as panelboards and disconnect switches.
  - 4. Furnish and install power and control connections to all mechanical, HVAC and miscellaneous equipment furnished.
  - 5. Furnish and install outdoor lighting system.
  - 6. Furnish and install new internet service to the Senior Center, including coordination with Frontier.
  - 7. Provide power system studies consisting of short circuit study, coordination study and arc-flash hazard analysis.

### B. Coordination:

- 1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with the site work, formwork, walls, partitions and ceilings.
- 2. Coordinate the electrical work with the work by others.

## C. General:

- 1. Dimensions shown on the Drawings that are related to equipment are based on one manufacturer's equipment. Coordinate the dimensions of the equipment furnished with the space allocated for that equipment.
- 2. The Drawings show the principal elements of the electrical installation. They are not intended as detailed working drawings for the electrical work but as a complement to the Specifications to clarify the principal features of the electrical systems.
- 3. It is the intent of this Section that all equipment and devices, furnished and installed under this and other Sections, be properly connected and interconnected electrically with other equipment so as to render the installations complete for successful operation, regardless of whether all the connections and interconnections are specifically mentioned in the Specifications or shown on the Drawings.
- 4. Mounting heights of switches, receptacles, fixtures and other devices noted in the Specifications and on the Drawings are to the bottom of the device.
- 5. Refer to Contract Drawings for areas of sheeting and excavation specified under other sections of the Contract. Contractor shall schedule his work on underground conduit runs and handholes in these areas to run concurrently with that of the site work.
- 6. The Contractor shall be responsible for excavation, backfilling, bedding, curbing removal and replacement, concrete cover above conduits, and surface restoration, including pavement for underground conduit and cable installation. Truck vehicle access (H-20 loading) shall be maintained on facility roads during construction.
- D. Related Work Specified Elsewhere:
  - 1. Division 1, Special Conditions.

- 2. Division 2, Sitework.
- 3. Division 3, Concrete.
- 4. Division 5, Metals.
- 5. Division 9, Finishes for field painting.
- 6. Division 13, Special Construction.
- 7. Division 15, Mechanical.
- 8. Division 18, Plumbing.
- E. Work Included But Specified Elsewhere:
  - 1. All site work required for the construction of the underground structures and pavement restoration shall conform to the requirements of Division 2, Sitework.
  - 2. Concrete work for equipment pads, conduit curbs, and concrete cover for buried conduit shall conform to the requirements of Division 3, Concrete.
  - 3. Anchor bolts and other fasteners shall conform to requirements of Division 5, Metals.
  - 4. Shop painting and surface preparation shall conform to requirements of Division 9, Finishes.
- F. Temporary Power: Temporary light and power for construction purposes shall be provided in accordance with Division 1, Special Conditions.

## 1.2 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
  - 1. Permits: The Contractor shall, at his own expense, furnish the Owner with a Certificate of Inspection from an approved inspection firm acceptable to the Owner attesting that all electrical work in this Contract has been inspected and is in compliance with the National Electrical Code.
  - 2. Codes: Material and equipment shall be installed in accordance with the current standards and

recommendations of the National Electrical Code, the National Electrical Safety Code and with local codes which apply. Where discrepancies arise between codes, the most restrictive regulation shall apply.

- 3. Tests by Independent Regulatory Agencies: Electrical material and equipment shall be new and shall bear the label of the Underwriters Laboratories, Inc., or other nationally-recognized, independent testing laboratory, wherever standards have been established and label service regularly applies.
- B. Reference Standards: Electrical material and equipment shall conform in all respects to the latest approved standards of the following:
  - 1. National Electrical Manufacturers Association (NEMA).
  - 2. The American National Standards Institute (ANSI).
  - 3. The Institute of Electrical and Electronic Engineers (IEEE).
  - 4. Insulated Cable Engineers Association (ICEA).
  - 5. National Electrical Code (NEC).
  - 6. National Electrical Safety Code (NESC).
  - 7. Occupational Safety and Health Code (OSHA).

## 1.3 SUBMITTALS

- A. General: Conform to requirements of the General Specifications and Special Conditions.
- B. Shop drawings shall include the following information to the extent applicable to the particular item:
  - 1. Manufacturer's name and product designation or catalog number.
  - 2. Electrical ratings.

- 3. Conformance to applicable standards or specifications of ANSI, ASTM, ICEA, IEEE, ISA, NEC, NEMA, NFPA, OSHA, UL, or other organizations.
- 4. Dimensioned plan, section, and elevations showing means for mounting, conduit connection, and grounding.
- 5. Materials and finish specification, including paints.
- 6. List of components including manufacturer's names and catalog numbers.
- 7. Internal wiring diagrams indicating all connections to components and numbered terminals for external connections.
- 8. Manufacturer's instructions and recommendations for installation, operation, and maintenance.
- 9. Manufacturer's recommended list of spare parts.

## 1.4 PROJECT CLOSE-OUT

- A. Operation and Maintenance Data: Conform to requirements of the General and Special Conditions.
- B. Provide Certificate of Inspection from an approved inspection firm acceptable to the Owner upon job completion prior to submission of final payment.
- C. Record Drawings: In addition to the requirements of Division 1, Special Conditions, the record drawings shall include the following:
  - 1. One line wiring diagrams of the 480/277-volt and 208/120 volt or 240/120 volt distribution systems.
  - 2. Actual in place conduit and cable layouts with schedule of conduit sizes and number and size of conductors.
  - 3. Layouts of the lighting and other equipment arrangements.

4. Control and noncontrol wiring diagrams with terminal numbers and all devices identified and indicating point-to-point terminations.

## 1.5 PRODUCT DELIVERY

- A. Delivery of Materials: Contractor shall instruct the manufacturers and vendors as to the maximum shipping sizes of equipment that can be accommodated at the site.
- B. Storage: Electrical equipment and material shall be stored and protected in accordance with Division 1 and General and Special Conditions.

## 1.6 IDENTIFICATION OF EQUIPMENT

- A. All electrical items shall be identified. Identification shall be in addition to the manufacturer's nameplates and shall serve to identify the items function and the equipment or system which it serves or controls.
- B. All new equipment shall be identified by means of laminated phenolic nameplates incised to show 1-inch high, white letters on a black background. Labels shall be fastened by means of 3/16-inch diameter, round-head, stainless steel, self-tapping screws. Equipment whose designation has been changed shall be relabeled accordingly.
- C. Wires and cables shall be color coded and identified by means of wire markers.
- D. Raceways shall be identified by means of vinyl adhesive tape.
- E. Pull and junction boxes shall be identified with laminated phenolic nameplates showing the names of the feeders or system wires and cables passing through them.
- F. The text, size, and type of lettering, and the location of identifying labels or tags, shall be approved by the Owner.

## 1.7 PROCEDURES FOR INSTALLATION

A. The Contractor is cautioned to perform his work with due regard to safety and in a manner that will not interfere

- with the existing equipment or in any way cause interruption of any of the functions of the facility.
- B. Work shall be carried out without disruption to facility operations.
- C. No existing equipment shall be removed, or any live circuits disturbed, without the specific direction and approval of the Owner, and without clearance by appropriate representatives of the Owner. Whenever such work is contemplated, the Contractor shall submit to the Owner a written request for scheduling such work. Written request must be received 5 working days prior to the date on which the proposed work is to be performed.

### 1.8 MAINTENANCE OF OPERATION

- A. Refer to Specification Section 01010 for Maintenance of Operation requirements.
- B. The Contractor shall be responsible for furnishing temporary generator sets to maintain facility operations for any facility functions, which would be disrupted by any portion of his work.
- C. The Contractor shall furnish written notice to the Engineer and Owner 5 working days prior to performing the work that requires a disruption of power. The written notice shall contain a schedule of proposed work.

## 1.9 AREA CLASSIFICATIONS

- A. Damp Locations: The following areas shall be considered damp locations:
  - 1. All outdoor locations, unless otherwise specified.
  - 2. Materials, equipment and incidentals in areas identified as damp locations shall meet NEC and NEMA requirements for wet locations. Enclosures installed in damp locations shall meet NEMA 4X stainless steel requirements as a minimum. Conduits shall be terminated at enclosures with watertight, threaded hubs.
- B. Dry Locations: The following areas shall be considered dry locations:

- 1. Senior Center.
- 2. Enclosures installed in these locations shall meet NEMA 12 requirements as a minimum.
- Corrosive Locations: The following areas shall be considered corrosive locations:
  - 1. None on this project.
  - 2. Enclosures installed in these locations shall meet NEMA 4X glass reinforced polyester (fiberglass) requirements as a minimum.

### ELECTRICAL AND INTERNET SERVICES

#### PART 1 - GENERAL

#### 1.1 DESCRIPTION

## A. Scope:

- 1. Contractor shall furnish all labor, materials and incidentals required to:
  - a. Furnish and install a new 208/120 volt electrical service to the Senior Center. The work includes furnishing and installing a primary electrical service from existing O&R riser pole to the new O&R padmounted transformer.
  - b. Furnish and install a new Frontier internet service to the Senior Center.
- 2. Contractor shall pay all utility charges for this work.

# B. Coordination:

- 1. Coordinate with O&R to establish requirements for the new service. O&R New Construction Services Field Office at Blooming Grove (845) 755-3324.
- 2. Coordinate with Frontier for the internet service to the Senior Center.

# C. Related Work Specified Elsewhere:

- 1. Section 16111, Conduit.
- 2. Section 16121, 15kv Cable.
- 3. Section 16122, 600 Volt Cable.
- 4. Section 16131, Pull and Junction Boxes.
- 5. Section 16450, Grounding System.

## 1.2 QUALITY ASSURANCE

- A. Reference Standards
  - 1. National Electrical Code (NEC).
  - 2. National Electrical Manufacturer's Association (NEMA).
  - 3. Orange and Rockland Utilities, Inc. General Specifications for Electric Installations.
  - 4. Frontier.

### 1.3 SUBMITTALS

- A. Shop Drawings: Submit for approval copies of manufacturers technical information, including the following:
  - 1. Site plan locating padmounted transformer, metering, related conduit and related wiring.
  - 2. Copies of all utility correspondence.

# PART 2 - PRODUCTS

# 2.1 ELECTRICAL EQUIPMENT

- A. Standby Power Source Sign: (NOT USED) Plastic sign shall be installed at the service entrance indicating type and location of generator set.
- B. Utility Metering: O&R approved metering shall be furnished and installed as shown on the Drawings.
- C. Grounding:
  - 1. Contractor shall ground the padmounted transformer in accordance with O&R requirements.
  - 2. Contractor shall ground the electrical service in accordance with NEC and O&R requirements.

### PART 3 - EXECUTION

### 3.1 INSTALLATION

### A. Electrical Service

- 1. Contractor shall furnish and install O&R-approved 15-kv cables from the riser pole to the padmounted transformer.
- 2. The Contractor shall furnish and install a concrete pad, footing and foundation as per O&R requirements for the padmounted transformer. Furnish and install ground rods for the padmounted transformer. The ground grid installation is to be at 18" below final grade elevation per O&R requirements. The Contractor shall leave a minimum of 10 feet of slack in the primary and secondary cables inside the padmounted transformer foundation.
- 3. The Contractor shall perform all wiring within the transformer pads, including the load break elbow connections to the primary bushings, and hylug connections to the secondary spade terminals. All required bonding and grounding hardware shall be provided and installed by the Contractor.
- 4. O&R approved primary termination kits shall be furnished and installed by the Contractor in accordance with O&R requirements.

### B. Internet Service

1. Contractor shall coordinate with Frontier for the new internet service as shown on the Drawings.

### 3.2 TESTING

A. Conduit and cable tests shall be in accordance with the specifications and O&R requirements.

#### 3.3 IDENTIFICATION

A. Conduits and cable shall be identified in accordance with Section 16100 of this specification.



### CONDUIT

#### PART 1 - GENERAL

#### 1.1 DESCRIPTION

## A. Scope:

- Contractor shall furnish all labor, materials, equipment and incidentals required to provide conduit and fittings as shown and specified to form complete, coordinated and grounded raceway systems.
- 2. The types of conduit required include the following:
  - a. Rigid galvanized steel for all exposed conduit runs, unless otherwise noted.
  - b. PVC, Schedule 40, for exterior underground duct banks as indicated.
  - c. PVC, Schedule 80, for 10-foot conduit length up riser pole and 90-degree elbow at base of riser pole, serving the primary service to the padmounted transformer.
- 3. Unless otherwise shown, all interior conduits shall be run exposed. All conduits, boxes and fittings in finished areas (rooms with suspended ceilings) shall be run concealed.

# B. Coordination:

- 1. Conduit runs shown are diagrammatic. Coordinate conduit installation with piping, ductwork, lighting fixtures and other systems and equipment and locate so as to avoid interferences.
- 2. Prior to installation of conduit, Contractor shall verify equipment locations where conduits are to be terminated and shall verify the size of conduit required for the actual size and number of wires to be installed in the conduits.

- C. Related Work Specified Elsewhere:
  - 1. Section 09900, Painting.
  - 2. Section 16116, Expansion Fittings.
  - 3. Section 16118, Flexible Conduits.
  - 4. Section 16131, Pull and Junction Boxes.
  - 5. Section 16134, Outlet Boxes.
  - 6. Section 16402, Underground Duct Banks.

## 1.2 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable provisions and recommendations of the following except where otherwise shown or specified:
  - 1. NEC Article 344, Rigid Metal Conduit: Type RMC.
  - 2. NEC Article 352, Rigid Polyvinyl Chloride Conduit: Type PVC.
  - 3. UL 6, Standard for Electrical Rigid Metal Conduit Steel.
  - 4. UL 514A, Standard for Metallic Outlet Boxes.
  - 5. UL 514B, Standard for Conduit, Tubing and Cable Fittings.
  - 6. UL 514C, Standard for Nonmetallic Outlet Boxes, Flush-device Boxes, and Covers.
  - 7. UL 651, Standard for Schedule 40 and 80 Rigid PVC Conduit and Fittings.
  - 8. ANSI C80.1, Standard for Electric Rigid Steel Conduit (ERSC).
  - 9. ANSI C80.3, Standard for Steel Electrical Metallic Tubing (EMT).
  - 10. NEMA TC2, Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.

11. NEMA TC3, Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing.

#### 1.3 SUBMITTALS

- A. Shop Drawings: Submit for approval the following:
  - Manufacturer's catalog cuts and technical information for the conduit, fittings, tooling, installation techniques and supports proposed for use.
  - 2. Construction details of conduit racks and other conduit support systems. Include calculations confirming the adequacy of the proposed systems to support the weight of the conduits and cables being furnished.
  - 3. Layout drawing showing proposed routing of exposed conduits, and concrete encased conduit duct banks directly buried in earth. Drawings shall show rack supports; locations of pull and junction boxes; all penetrations in walls and floor slabs; and equipment where conduit terminates.
- B. Record Drawings: Include the actual routing of exposed and below grade conduit runs on record drawings.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Rigid Galvanized Steel Conduit, Elbows and Couplings:
  - 1. Material: Rigid, heavy wall, mild steel, hot dip galvanized inside and out, smooth interior, tapered threads and carefully reamed ends; 3/4-inch NPS minimum size.
  - 2. Manufacturers: Provide material manufactured by one of the following:
    - a. Allied Tube and Conduit Corporation.
    - b. Robroy Industries Inc.
    - c. Or approved equal.

- B. Plastic Conduit Schedule 80 PVC:
  - 1. Material: Schedule 80 PVC plastic, NEMA Type TC-2, 90°C rated, conforming to UL 651.
  - 2. Product and Manufacturer: Provide one of the following:
    - a. Carlon Plus 80.
    - b. Certainteed Corporation.
    - c. Scepter Mfg. Co.
    - d. Or approved equal.
- C. Plastic Conduit-Schedule 40 PVC:
  - 1. Material: Schedule 40 PVC plastic, NEMA Type TC-2, 90°C rated, conforming to UL 651.
  - 2. Product and Manufacturer: Provide one of the following:
    - a. Carlon Plus 40.
    - b. Certainteed Corporation.
    - c. Scepter Mfg. Co.
    - d. Or approved equal.
- D. Conduit Fittings and Outlet Bodies:
  - 1. Material and Construction: For rigid galvanized steel conduit systems, cast gray iron alloy or cast malleable iron bodies and covers; all units to be gasketed and watertight. Gaskets to be of an approved type designed for the purpose. Improvised gaskets not acceptable. All units to be threaded type with five full threads. Material to conform to ANSI C80.4 and be listed by UL. Fittings and bodies in or on PVC conduit runs shall be Schedule 80 PVC. All screws and miscellaneous hardware shall be stainless steel.
  - 2. Manufacturers: Provide material manufactured by one of the following:

- a. Crouse-Hinds Company.
- b. Appleton Electric Company.
- c. Killark.
- d. Robroy Industries, Inc.
- e. Or approved equal.

## E. Conduit Hubs:

- 1. Material: Threaded conduit hub, vibration proof, weather proof with captive O-ring seal, zinc metal with insulated throat. Hubs used on PVC conduit systems shall be Schedule 80 PVC.
- 2. Use: Provide for all conduit terminations to boxes, cabinets and other enclosures.
- 3. Manufacturer: Provide material manufactured by Myers Electrical Products Company or approved equal.

# F. Supports, Fasteners:

- 1. Individual rigid galvanized steel conduits shall be supported using rigid hot-dip galvanized steel one-hole straps and back straps.
- 2. Multiple rigid galvanized steel conduits shall be supported on rigid hot-dip galvanized steel electrical channel with straps.
- 3. Threaded fasteners shall be stainless steel, including screws, anchors, rods, nuts, spacer washers and miscellaneous items.
- 4. Supports used on PVC conduit systems shall be fiberglass.
- G. Conduit Markers: Conduit markers shall be vinyl adhesive tape engraved with the conduit designation and affixed to the conduit.

### PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Install in conformance with National Electrical Code requirements.
- B. Dissimilar Metals:
  - 1. Take every action to prevent the occurrence of electrolytic action between dissimilar metals.
  - 2. Do not use copper products in connection with aluminum work, and do not use aluminum in locations subject to drainage of copper compounds on the bare aluminum.

## C. Supports:

- 1. Rigidly support conduits by clamps, hangers, channels or conduit racks.
- 2. Support single conduits by means of one-hole pipe clamps in combination with one-screw back plates, to raise conduits from the support surface. Support multiple runs of conduits on trapeze type hangers with hot-dip galvanized steel horizontal members and threaded hanger rods, Kindorf or equal. Rods shall be not less than 3/8-inch diameter and shall be stainless steel.
- 3. For exposed PVC conduit systems, supports shall be fiberglass, Robroy or approved equal.
- D. Fastenings: Fasten raceway systems rigidly and neatly to supporting structures by the following methods:
  - 1. To Wood: Wood screws.
  - 2. To Hollow Masonry Units: Toggle bolts.
  - 3. To Brick Masonry: Price expansion bolts or equal.
  - 4. To Concrete: Phillips: Hilti Corporation: or approved equal, anchors.
  - 5. To steel: Welded threaded studs, beam clamps or bolts with lock washers or locknuts.

E. Plug or cap conduit ends at the time of installation to prevent the entrance of moisture and foreign materials.

# F. Empty Conduits:

- 1. Install nylon pull wire in each empty conduit and cap conduits not terminating in boxes with permanent fittings designed for the purpose.
- 2. Identify each empty conduit with a durable tag showing the conduit number indicated on the Drawings.
- G. Make underground and embedded conduit joints watertight to prevent ground water from entering buildings.

#### H. Orientation:

- 1. Install parallel or perpendicular to structural members or walls, unless concealed.
- 2. Wherever possible, run in groups.
- 3. Install on structural members in protected locations.
- 4. Locate clear of interferences.
- 5. Locations shown on Drawings are approximate only.
- I. Clearance: Maintain 6 inches from hot fluid lines and 1/4 inch from walls.
- J. End Cuts: Square and ream to prevent damage to wire and cable.
- K. Field Bends: No indentations. Diameter of conduit shall not vary more than 15 percent at any bend.

## L. Threads:

- 1. Apply conductive compound, Kopr-Shield by T&B Corporation, or approved equal to all joints before assembly.
- 2. Make up joints tight and ground thoroughly.

- 3. Conduit and fitting threads to be standard tapered pipe threads. Standard straight thread conduit couplings permitted only on exposed indoor conduit runs. Running threads not permitted.
- 4. Use strap wrenches and vises to install conduit. Conduit with wrench marks to be replaced.

## M. Insulated Bushings:

- 1. Provide insulated bushings on all conduits entering boxes or cabinets.
- 2. Provide locknuts on both inside and outside of enclosures except where threaded hubs are provided.
- 3. Bushings not to be used in lieu of locknuts.

# N. Vertical Drops:

- 1. Rigidly support from equipment or building.
- 2. Unsecured drop length not to exceed 12 feet.
- 3. Install vertical runs plumb. No diagonal runs.
- O. Thruwall Seals: Install for conduits passing through subsurface walls or floor slabs of buildings.

#### 1. Manufacturer:

- a. Thunderline "Link Seal".
- b. O-Z/Gedney.
- c. Or approved equal.

## P. Drainage:

- 1. Pay particular attention to drainage for conduit runs.
- 2. Wherever possible, install conduit runs so as to drain to one end and away from buildings.
- 3. Take extreme care to avoid pockets or depressions in conduit.

### O. Conduit Curb:

- 1. In concrete slabs or floors, provide a two inch high curb extending two inches from the outer surface of the conduit penetrating the floor, to prevent corrosion.
- 2. Terminate conduit stub-ups in couplings, slightly above the finished concrete curb.
- R. Couplings: Provide full threaded conduit couplings. Split couplings shall not be permitted.
- S. For individual exposed conduits passing through floor slabs and walls, install sleeves to protect the conduit against action of alkaline substances which may be present.
- T. Before concrete is placed, make the necessary location measurements of the conduit to be embedded so that the information is available to prepare record drawings.
- U. Install individual underground conduits 24 inches (minimum) below grade and provide concrete cover above conduits, unless otherwise indicated on the Drawings. Perform all excavation, backfilling, bedding, curbing removal and replacement, concrete encasement, and surface restoration including pavement for underground conduit installation.
- V. Core drill for individual conduits passing through existing concrete walls or slabs. Obtain authorization from Owner prior to core drilling. Seal spaces around conduit as per 3.1.0 above.
- W. Conduit Racks: For rigid galvanized steel conduit systems, provide hot-dip galvanized steel conduit racks of suitable width, length and height and arranged to suit field conditions. For PVC conduit systems, conduit racks shall be fiberglass. Support shall be provided at every ten feet minimum.
- X. PVC schedule 80 heavy wall conduit shall be used when entering or exiting new concrete pours, except in hazardous areas where prohibited by code.
- Y. Conduit Expansion and Deflection Fittings: Conduit expansion and/or deflection fittings shall be provided

wherever conduit crosses a structural expansion joint, is attached between two separate structures or wherever the conduit run is 100 feet or more in a single straight length.

- Z. Exposed conduits, boxes and fittings shall be painted in accordance with Specification Section 09900.
- AA. Install conduit to maintain fire resistance rating of walls and ceilings. Furnish and install a noncombustible compound that functions as a fire stop sealant for conduit penetrations. Compound shall be GyProc Fire-Halt Sealant or approved equal.

#### 3.2 TESTING

- A. Test conduits by pulling through each conduit a cylindrical mandrel not less then two pipe inside diameters long, having an outside diameter equal to 90 percent of the inside diameter of the conduit.
- B. Maintain a record, by number, of all conduits testing clear.

# 3.3 IDENTIFICATION

- A. Identify all conduits at the ends and in all intermediate boxes, chambers, hand holes and other enclosures. All conduits shall be identified every 75 feet.
- B. Conduit numbers shall be assigned in accordance with the Conduit and Cable Schedule.

### **EXPANSION FITTINGS**

#### PART 1 - GENERAL

## 1.1 DESCRIPTION

- A. Scope: Contractor shall furnish all labor, materials, equipment and incidentals required to provide conduit expansion and deflection fittings as shown, specified or required.
- B. Related Work Specified Elsewhere:
  - 1. Section 16111, Conduit.

## 1.2 QUALITY ASSURANCE

- A. Comply with applicable provisions and recommendations of the following except where otherwise shown or specified:
  - 1. NEC Article 300, Wiring Methods.
  - 2. UL 514B, Standard for Conduit, Tubing and Cable Fittings.
  - 3. UL 467, Standard for Grounding and Bonding Equipment.

### 1.3 SUBMITTALS

A. Shop Drawings: Submit for approval copies of manufacturer's technical information for expansion and deflection fittings proposed for use.

#### PART 2 - PRODUCTS

## 2.1 MATERIALS

A. Expansion Fittings: Malleable or ductile iron, hot-dip galvanized, stainless steel clamps and tinned copper braid bonding jumper. Fitting shall be watertight, corrosion-resistant, UL listed and compatible with the conduit system.

- B. Deflection/Expansion Fittings: Neoprene sleeve, stainless steel bands, and tinned copper braid bonding jumper, suitable for concrete encasement in nonhazardous areas. Fitting shall be watertight, corrosion resistant, UL listed and compatible with the conduit system.
- C. Product and Manufacturer: Provide one of the following:
  - 1. Type DX for expansion/deflection or AX for expansion only by O-Z/Gedney Company.
  - 2. Or approved equal.

# PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install in conformance with the National Electrical Code where necessary to compensate for thermal expansion and contraction.
- B. Install expansion/deflection fittings where conduits cross structural expansion joints.
- C. Install expansion/deflection fittings in conduit duct banks where conduit is attached between two separate structures.
- D. Install expansion fittings in conduit runs which are 100 feet or more in a single straight length.
- E. Where required in nonmetallic conduit and duct systems, provide necessary coupling to make transition to the threaded metallic fitting.

### FLEXIBLE CONDUITS

### PART 1 - GENERAL

# 1.1 DESCRIPTION

A. Scope: Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install flexible conduit.

# 1.2 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable provisions and recommendations of the following except where otherwise shown or specified.
  - 1. NEC Article 350, Liquidtight Flexible Metal Conduit: Type LFMC.
  - 2. UL 360, Standard for Liquid-Tight Flexible Steel Conduit.
  - 3. UL 1660, Standard for Liquid-Tight Flexible Nonmetallic Conduit.

#### 1.3 SUBMITTALS

- A. Shop Drawings: Submit for approval the following:
  - 1. Manufacturer's catalog literature, specifications and technical data for flexible conduit and fittings proposed for use.

### PART 2 - PRODUCTS

# 2.1 MATERIALS

- A. Flexible Conduit Dry and Damp Locations:
  - 1. Material: Flexible galvanized steel core with smooth, abrasion resistant, liquid-tight, neoprene cover. Continuous copper ground built in for sizes

- 3/4-inch through 1 1/4-inch. Material shall be UL listed.
- 2. Product and Manufacturer: Provide one of the following:
  - a. Sealtite UA by Anaconda Metal Hose Division, Anaconda American Brass Company.
  - b. Liquatite Type L.A. by Electri-Flex Company.
  - c. Or approved equal.
- B. Flexible Conduit Fittings Dry and Damp Locations:
  - 1. Material and Construction: Malleable iron with zinc electroplate. Fittings shall adapt the conduit to standard threaded connections, shall have an inside diameter not less than that of the corresponding standard conduit size and shall be UL listed.
  - 2. Manufacturers: Provide products of one of the following:
    - a. Crouse-Hinds Company.
    - b. Appleton Electric Company.
    - c. Or approved equal.
- C. Flexible Conduit Corrosive Locations:
  - 1. Material: Flexible nonmetallic conduit, liquidtight. Material shall be UL listed.
  - 2. Product and Manufacturer: Provide one of the following:
    - a. Carflex liquid-tight flexible nonmetallic conduit by Carlon.
    - b. Or approved equal.
- D. Flexible Conduit Fittings Corrosive Locations:
  - 1. Material and Construction: Thermoplastic or PVC liquid-tight nonmetallic. Fittings shall adapt the

conduit to standard threaded connections, shall have an inside diameter not less than that of the corresponding standard conduit size and shall be UL listed

- 2. Manufacturers: Provide products of one of the following:
  - a. Carflex liquid-tight nonmetallic fittings by Carlon.
  - b. Or approved equal.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install at motors and equipment which are subject to vibration or require movement for maintenance purposes. Provide necessary reducer where equipment furnished cannot accept 3/4-inch size flexible conduit. Limit flexible conduit length to three feet maximum and install only where required as noted above.
- B. Install in conformance with National Electrical Code requirements.



### 15 kv CABLE

#### PART 1 - GENERAL

#### 1.1 DESCRIPTION

A. Scope: Contractor shall furnish all labor, materials, equipment and incidentals required to provide 15 kv cable as shown and specified.

## 1.2 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
  - 1. Codes: Cable shall be installed in accordance with the current standards and recommendations of the National Electrical Code and with local codes which apply. Where discrepancies arise between codes, the most restrictive regulation shall apply.
  - 2. Tests by Independent Regulatory Agencies: Cable shall bear the label of the Underwriters Laboratories, Incorporated.
- B. Reference Standards: Comply with applicable provisions and recommendations of the following except where otherwise shown or specified:
  - 1. National Electrical Code.
  - 2. ANSI/ICEA S-94-649, Concentric Neutral Cables Rated 5 through 46 kv.
  - 3. AEIC CS8, Extruded Dielectric, Shielded Power Cables Rated 5 through 46 kv.
  - 4. National Electrical Safety Code (ANSI C2).
  - 5. Orange and Rockland Utilities, Inc. (O&R).
    - a. Appendix III.B, Three Phase Padmounted Transformer Installation.

### 1.3 SUBMITTALS

- A. Shop Drawings: Submit for approval of manufacturer's technical information for 15 kv cable.
  - Manufacturer's catalog cuts and technical information indicating compliance with this Specification. Any exceptions shall be stated and completely explained.
  - 2. Shop Drawings or catalog cuts shall be accompanied by literature identifying the methods and materials which the Contractor proposes to use to make splices and terminations. Submittal shall consist of manufacturers' literature evidencing compatibility of the conductor insulation, shield and jacket of the cable with the splicing of terminating materials and methods which the Contractor proposes to use.
- B. Test Reports: Submit for approval copies of field highpotential tests of all 15 kv cable, splices and terminations.
- C. Record Drawings: Submit record drawings showing the locations of all concealed installations of 15 kv cables.

# PART 2 - PRODUCTS

# 2.1 MATERIALS

A. General: Cable furnished under this specification shall be #2 aluminum, 15 kv, shielded cable, consisting of one compact round stranded conductor with extruded ethylene propylene rubber (EPR) insulation with an insulation thickness of 175 mils. Cable shall meet O&R requirements.

### B. Materials:

- 1. Conductor: All conductors shall be 1350-H19 aluminum alloy with concentric-lay Class B round stranding.
- Conductor Shielding: All conductors shall be covered with a layer of extruded semiconducting EPR

- with thickness in accordance with Table 3-1 of ANSI/ICEA S-94-649.
- 3. Insulation System: The insulation system shall be composed of an extruded ethylene propylene rubber. The insulation system shall be suitable for use at conductor temperatures not exceeding 90°C for normal operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions. Minimum average thickness of the insulation system at any point of the cable shall not be less than 175 mils. The minimum thickness at any part of the cable shall not be less than 90 percent of the specified average.
- 4. Insulation Shield: Over the insulation shall be applied an extruded semiconducting ethylene propylene rubber. Insulation shield minimum thickness shall be 30 mils.
- 5. Concentric Neutral: A concentric neutral consisting of annealed bare copper wires in accordance with ICEA shall be spirally applied over the extruded insulation shield with uniform spacing between wires.
- 6. Jacket: The cable shall have a 50-mil thick semi-conducting black linear low density polyethylene (LLDPE) jacket extruded to fill over the concentric neutrals. Three equally spaced longitudinal red stripes shall be extruded on the jacket.
- 7. Identification: All cable shall be identified with permanent printed markings that state the following: name of manufacturer; year of manufacture; conductor size and material; type and thickness of insulation; type of jacket; cable voltage rating; NESC "Lightning Bolt" before and after the words "Electric Cable."
- C. Product and Manufacturer: Provide one of the following:
  - 1. Kerite (SCPE-HTK).
  - 2. Okonite Okoguard URO-J.
  - 3. Or approved equal.

- D. Cable Markers: Provide material manufactured by one of the following:
  - 1. Onmi-Grip by W.H. Brady Company.
  - 2. Preprinted, self-adhesive vinyl tapes for larger diameter cables, by W.H. Brady Company.
  - 3. Or approved equal.

#### PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. The minimum cover for primary service shall be as shown on the Drawings.
- B. As much physical separation as possible shall be given between primary and secondary cables within the padmount transformer foundation.
- C. Install all cables complete with proper terminations at both ends. Check for proper phase sequence and proper motor rotation.
- D. Splicing and Termination:
  - 1. Where possible, install cable continuous, without splice from termination to termination.
  - 2. Where required, splicing shall only be made with the written consent of the Owner or the electric utility.
  - 3. Primary load break elbows will be delivered by O&R with the padmount transformer. The Contractor shall install the elbows in accordance with O&R requirements.
  - 4. Use experienced personnel familiar with the materials and procedures to be employed.

# E. Pulling:

- Conductors shall be pulled in from reels. In no case shall conductors be laid on the ground or floor and pulled in.
- 2. Conductors shall be factory fitted with pulling devices, or at the option of the Contractor, fitted in the field with pulling baskets (Kellems grips).
- 3. When using factory fitted pulling device or other pulling devices, discard 2-feet of the conductors prior to splicing or terminating.
- 4. Pulling tension(s), side wall pressure and bending radii shall not exceed cable manufacturer's written recommendations.
- 5. Calculations for tensions and side wall pressures shall be completed and approved prior to pull by the Contractor.
- 6. Pulling tension(s) shall be constantly monitored during the pull.
- 7. Use a dynamometer where mechanical means are used.
- 8. Use only pulling compounds approved by cable manufacturer.
- 9. Splices and taps for conductors shall be made per cable manufacturer's recommendation and the Engineer's approval, unless otherwise shown or specified. All splices shall be performed by qualified high voltage splicers.
- F. Bending Radius: Limit to 12 times cable overall diameter.
- G. Slack: Provide maximum slack at all terminal points and in all manholes.
- H. Identification: Identify all conductors by circuit number and phase at each end with cable markers.
- I. Wrap individual 15 kv cables located within manholes or handholes with fireproofing tape of self-extinguishing

material which will not support combustion. Tape shall not deteriorate when subjected to water, salt, sewage or fungus and shall be secured with glass cloth tape. Fireproofing tape shall be Scotch No. 7700 with Scotch No. 27 binding, or approved equal.

- J. Install in conformance with National Electrical Code National Electrical Safety Code, and O&R requirements.
- K. Color code cables as follows: Phase A, B, C: Brown, Orange, Yellow.
- L. Install a warning ribbon below finished grade over the primary service. The identifying ribbon shall be a polyvinyl chloride tape, 6 inches wide, yellow color, permanently imprinted with "CAUTION BURIED ELECTRIC LINE BELOW" in block letters.

#### 3.2 TESTING

- A. Testing of 15kv cable shall be performed by an independent UL certified testing laboratory currently specializing in this procedure.
- B. Qualification Discharge Resistance Test: The proposed insulation system shall be unaffected by electrical discharge when tested in accordance with the procedures specified in ICEA S-94-649.
- C. Production Tests:
  - 1. Final Voltage and Insulation Resistance Test: The completed cable, while on the shipping reel, shall be tested at room temperature at a minimum of 26 kv AC for one minute. The insulation resistance shall also be measured and the insulation resistance constant shall not be less than 20,000 megohms per 1,000 feet.
- D. Installation Tests: Perform a high potential test on each 15 kv cable installation.
  - Adhere to following procedures before performing do over potential tests:
    - a. Disconnect all equipment i.e., transformers, switches, motors, circuit breakers, surge

- arrestors etc., from cable circuit to prevent test interruptions due to flashovers or trip outs resulting from excessive leakage current.
- b. Establish adequate clearance between the circuit test ends and any grounded object and to other equipment not under test.
- c. Ground all circuit conductors not under test, all cables shields and nearby equipment.
- d. Clean insulation surfaces.
- e. Keep cable ends dry.
- 2. When required by the Engineer, such tests shall be performed in his presence. Before conducting tests, the Contractor shall submit to the Engineer, for approval, a written outline of the methods and equipment to be used. This outline shall be prepared by the testing laboratory. All test equipment shall be provided by the testing laboratory.
- 3. All 15 kv cable insulation shall be tested after installation. Tests shall be with dc voltage and shall be not less than 80% of factory test voltage. Increase potential slowly in 8 to 10 equal steps. A plot of leakage current versus voltage shall be made and submitted to the Engineer.
- 4. Stop test if the leakage current increases excessively or a "knee" appears in the curve before reaching maximum test voltage.
- 5. Upon reaching the specified maximum test voltage, maintain the voltage for 5 minutes, reading the leakage current every 30 seconds and plot leakage current versus time on the same graph as the step voltage curve.
- 6. New cable failing the test shall be repaired or replaced and retested. If a test failure occurs on a new cable interconnected to an existing cable, notify the Engineer for further instructions.

7. The test curves shall be signed by the tester, initialed by the Owner's inspector and shall be submitted to the Engineer for review.

### 600 VOLT CABLE

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. Scope: Contractor shall furnish all labor, materials, equipment and incidentals required to provide 600-volt cable as shown and specified.
- B. Related Work Specified Elsewhere:
  - 1. Section 16450, Grounding System.

## 1.2 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
  - 1. Codes: Cable shall be installed in accordance with the standards and recommendations of the National Electrical Code and with local codes which apply. Where discrepancies arise between codes, the most restrictive regulation shall apply.
  - 2. Tests by Independent Regulatory Agencies: Cable shall bear the label of the Underwriters Laboratories, Inc.
- B. Reference Standards: Comply with applicable provisions and recommendations of the following except where otherwise shown or specified:
  - 1. ASTM B 3, Soft or Annealed Copper Wire.
  - 2. ASTM B 8, Concentric-Lay-Stranded Copper Conductors, Hard, Medium-hard or Soft.
  - 3. ICEA S-95-658/NEMA WC70, Nonshielded Power Cables Rated 2,000 V or Less.
  - 4. National Electrical Code.
  - 5. UL 44, Standard for Thermoset-insulated Wires and Cables.

- 6. UL 83, Standard for Thermoplastic-insulated Wires and Cables.
- 7. UL 854, Standard for Service-Entrance Cables.

#### 1.3 SUBMITTALS

A. Shop Drawings: Submit for approval manufacturer's literature, specifications, and engineering data for 600 volt insulated cable.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Insulated Cable In Raceways:
  - 1. Material: Single conductor copper cable conforming to ASTM B8 with abrasion resistant, moisture and heat resistant polyvinyl chloride insulated, nylon jacketed rated 90C in dry locations and 90C in wet locations. Cable shall be listed by UL as Type THWN-2. All underground raceways for power wiring shall be wired using extra heavy cross-linked polyethylene wire insulation, rated type USE-2/RHW-2.
  - 2. Where cable is designated as multiconductor on the Drawings (10/c for example), the conductors shall have an overall PVC jacket.
  - 3. Wire Sizes: Not smaller than No. 12 AWG for power and lighting and No. 14 AWG for control.
  - 4. Stranding: All 600 volt cable shall be stranded.
  - 5. Product and Manufacturer: Provide material manufactured by one of the following:
    - a. Okonite Company.
    - b. Superior Essex.
    - c. Or approved equal.

- B. Cable Connectors, Splices and Terminals, Solderless Type:
  - 1. For stranded wire sizes up to #6 AWG, use compression type.
  - 2. Product and Manufacturer: Provide one of the following:
    - a. T&B Sta-Kon.
    - b. Burndy Hylug.
    - c. Or approved equal.
  - 3. For sizes #4 AWG and above, use either compression type or bolted type with silver plated contact faces.
  - 4. For sizes #250 MCM and larger, use connectors and terminals with at least 2 cable clamping elements or compression indents and provision for at least 2 bolts for joining to apparatus terminal.
- C. Cable Markers: Product and Manufacturer: Provide one of the following:
  - a. Omni-Grip by W.H. Brady Company.
  - b. Or approved equal.

### PART 3 - EXECUTION

# 3.1 INSTALLATION

- A. Install all cables complete with proper terminations at both ends. Check and correct for proper phase sequence and proper motor rotation.
- B. Pulling:
  - 1. Use insulating types of pulling compounds containing no mineral oil.
  - Pulling tension shall be within the limits recommended by the wire and cable manufacturer.

- 3. Use a dynamometer where mechanical means are used.
- 4. Cut off section subject to mechanical damage.
- C. Bending Radius: Limit to 6 times cable overall diameter.
- D. Slack: Provide maximum slack at all terminal points.

# E. Splices:

- 1. Where possible, install cable continuous, without splice, from termination to termination.
- 2. Where required, splice in junction box using terminal boards.
- 3. Splices in conduits are not allowed.
- 4. Use of screw shell splices, "wire nuts" is not permitted.
- F. Identification: Identify all conductors by circuit number and phase or wire number, at each terminal or splice location. Control conductors shall be numerically coded.
- G. Color code power cables as follows: 208 volt systems blue, black, and red; 240-volt systems blue, black and orange; 480 volt systems brown, orange, and yellow; neutral white; equipment ground green; isolated ground green with yellow stripe.

## 3.2 TESTING

- A. Test each electrical circuit after permanent cables are in place to demonstrate that the circuit and connected equipment perform satisfactorily and that they are free from improper grounds and short circuits.
- B. Individually test 600-volt cables for insulation resistance between phases and from each phase to ground. Test after cables are installed and before they are put in service with a Megger whose rating is suitable for the tested circuit. Tests shall meet with the applicable specifications of ICEA S-95-658/NEMA WC70.
- C. The insulation resistance for any given conductor shall not be less than the value recommended by the ICEA or a

minimum of 1 megohm for 600-volt and less service, if not ICEA listed. Any cable not meeting the recommended value or which fails when tested under full load conditions shall be replaced with a new cable for the full length.



### PULL AND JUNCTION BOXES

### PART 1 - GENERAL

# 1.1 DESCRIPTION

A. Scope: Contractor shall furnish all labor, materials, equipment and incidentals required to provide pull and junction boxes as shown, specified or required.

# 1.2 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable provisions and recommendations of the following except where otherwise shown or specified:
  - 1. NEC Article 314, Outlet, Device, Pull, and Junction Boxes; Conduit Bodies; Fittings; and Handhole Enclosures.
  - 2. UL 50, Standard for Enclosures for Electrical Equipment, Non-Environmental Considerations.
  - 3. UL 50E, Standard for Enclosures for Electrical Equipment, Environmental Considerations.
- B. Coordination: Coordinate pull box and junction box installations with piping and other systems and structures. Locate clear of interferences.

### 1.3 SUBMITTALS

A. Shop Drawings: Submit for approval copies of manufacturer's technical information for pull and junction boxes proposed for use.

# PART 2 - PRODUCTS

- A. Junction and Pull Boxes; Small:
  - 1. Material and Construction:

- a. In dry locations, unless otherwise noted on the Drawings, cast gray iron alloy or cast malleable iron bodies and covers, with natural finish. Boxes in damp locations shall be NEMA 4X, stainless steel. Boxes used on PVC conduit systems shall be NEMA 4X, fiberglass.
- b. Neoprene gaskets. Gaskets to be of an approved type designed for the purpose. Improvised gaskets not acceptable.
- c. Stainless steel cover screws.
- d. External mounting lugs.
- e. Integral cast insulated hubs.
- f. Boxes where conduits enter a building below grade shall have 1/4-inch drain hole.
- 2. Manufacturers: Provide material manufactured by one of the following:
  - a. Crouse-Hinds Company.
  - b. Appleton Electric Company.
  - c. Stahlin Enclosures/Robroy Industries.
  - d. Or approved equal.
- B. Junction and Pull Boxes; Large: Large boxes not available in cast construction shall be fabricated from type 304 stainless steel. Boxes shall have continuously welded seams. Welds shall be ground smooth. Box bodies shall be flanged and shall have no holes or knockouts. Box bodies shall not be less than 14-gauge metal and covers shall not be less than 12 gauge metal. Covers shall be fastened with stainless steel hinges and screws. Covers on pull boxes larger than 24-inch x 24-inch shall have handles and shall be reinforced and rigid. All conduit entries to sheet metal boxes shall be made using gasketed "O-ring" insulated hubs.

# 3.1 INSTALLATION

- A. Mount boxes so that sufficient access and working space is provided and in accordance with the requirements of the National Electrical Code.
- B. Securely fasten boxes to walls or other structural surfaces on which they are mounted with stainless steel hardware. Provide independent heavy duty, stainless steel supports where no walls or other structural surface exists.
- C. Install pull boxes in runs containing more than three 90 degree bends, runs exceeding 200 feet, where indicated on the Drawings and in conformance with the National Electrical Code.
- D. Size junction and pull boxes in accordance with the requirements of the National Electrical Code.
- E. Provide copper terminal blocks in junction boxes where junction or splices are required in cables. Power terminal blocks shall be rated from 50 to 150 amperes, 600 volt, with one-piece phenolic material and binding screw type, as manufactured by GE type CR2960SY139C series or equal. Wire nuts are not permitted.
- F. Metal barriers shall be installed in all pullboxes containing shielded instrumentation cable and power cable. The barriers shall separate the shielded instrumentation cable from the power cable.



### OUTLET BOXES

### PART 1 - GENERAL

### 1.1 DESCRIPTION

A. Scope: Contractor shall furnish all labor, materials, equipment and incidentals required to provide outlet boxes for mounting wiring devices and for supporting lighting fixtures as shown, specified and required.

# 1.2 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable provisions and recommendations of the following except where otherwise shown or specified:
  - 1. NEC Article 314, Outlet, Device, Pull, and Junction Boxes; Conduit Bodies; Fittings; and Handhole Enclosures.
  - 2. UL 514A, Standard for Metallic Outlet Boxes.
  - 3. UL 514B, Standard for Conduit, Tubing and Cable Fittings.
  - 4. UL 514C, Standard for Nonmetallic Outlet Boxes, Flush-device Boxes, and Covers.

## PART 2 - PRODUCTS

# 2.1 MATERIALS

### A. Device Boxes:

- 1. Material: Cast gray iron alloy, or cast malleable iron, with zinc electroplate finish in dry and damp locations (weathertight in damp locations), and weather tight PVC in corrosive locations. Boxes shall include external mounting lugs.
- 2. Device Cover Plates (Receptacles and Miscellaneous Items Only):

- a. Stainless steel Type 304 alloy for dry and damp locations. Weathertight PVC for corrosive locations.
- b. Weather tight, gasketed spring door cover for devices in damp locations, and corrosive locations. Aluminum in damp locations, PVC in corrosive locations.
- c. Stainless steel screws and hardware.
- 3. Manufacturers: Provide material manufactured by one of the following:
  - a. Crouse-Hinds Company.
  - b. Appleton Electric Company.
  - c. Carlon Electrical Products.
  - d. Or approved equal.

## 3.1 INSTALLATION

- A. Fasten boxes rigidly and neatly to supporting structures, with stainless steel hardware.
- B. For units mounted on masonry or concrete walls, provide suitable 1/2-inch spacers to prevent mounting back of box directly against wall.
- C. Leave no open conduit holes in boxes. Close unused openings with capped bushings
- D. Label each circuit in boxes and identify with durable tag.
- E. Install in conformance with National Electrical Code.
- F. Lighting fixtures shall not be supported from PVC boxes.

### **SWITCHES**

### PART 1 - GENERAL

# 1.1 DESCRIPTION

- A. Scope: Contractor shall furnish all labor, materials, equipment and incidentals required to provide switches for lighting and other systems as shown and specified.
- B. Related Work Specified Elsewhere:
  - 1. Section 16134, Outlet Boxes.

# 1.2 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable provisions and recommendations of the following except where otherwise shown or specified.
  - 1. National Electrical Code.
  - 2. UL 20, Standard for General-use Snap Switches.

# 1.3 SUBMITTALS

A. Shop Drawings: Submit for approval copies of manufacturer's technical information for switches proposed for use.

# PART 2 - PRODUCTS

- A. Dry Locations: Single pole AC toggle switch, quiet type, 120/277 volt AC, 20 ampere, Ivory, specification grade.
  - 1. Product and Manufacturer: Provide one of the following:
    - a. Cat. #1221-I, by Harvey Hubbell Incorporated (3-way: Cat. #1223-I).

- b. Cat. #1991-I, by Arrow-Hart Incorporated (3-way: Cat. #1993-I).
- c. Or approved equal.
- B. Damp Locations: 120 v AC, 20-ampere single pole snap switch, aluminum, weathertight.
  - 1. Product and Manufacturer:
    - a. Series EDS by Crouse Hinds.
    - b. Or approved equal.
- C. Corrosive Locations: NEMA 4X PVC box and cover. Furnish and install AC toggle switch (as specified above) in PVC box with toggle switch cover.
  - 1. Product and Manufacturer:
    - a. PVC box with Model E98TSC cover, by Carlon.
    - b. Or approved equal.
- D. Contactors, where indicated, shall control lighting. Contactors shall be mechanically held, 277 volts, suitable for two-wire control. Specific model numbers shown on Drawings.
  - 1. Product and Manufacturer:
    - a. Square D.
    - b. Or approved equal.

## 3.1 INSTALLATION

- A. Install wiring devices in outlet or device boxes with device cover plates in accordance with Section 16134.
- B. Mount wall switches 4 feet 6 inches above finished floor unless otherwise noted.

C. Install switches in conformance with National Electrical Code.



### RECEPTACLES

### PART 1 - GENERAL

# 1.1 DESCRIPTION

- A. Scope: Contractor shall furnish all labor, materials, equipment and incidentals required to provide receptacles as shown and specified.
- B. Related Work Specified Elsewhere:
  - 1. Section 16134, Outlet Boxes.

# 1.2 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable provisions and recommendations of the following except where otherwise shown or specified:
  - 1. National Electrical Code.
  - 2. UL 498, Standard for Attachment Plugs and Receptacles.
  - 3. UL 943, Standard for Safety for Ground-fault Circuit Interrupters.

### 1.3 SUBMITTALS

A. Shop Drawings: Submit for approval copies of manufacturer's technical information for receptacles proposed for use.

### PART 2 - PRODUCTS

- A. Dry Locations: Duplex grounding receptacle, two pole, three wire, 125 volt AC, 20 ampere.
  - 1. Product and Manufacturer: Provide one of the following:

- a. Cat. #5362, by Harvey Hubbell Incorporated.
- b. Cat. #5362, by Arrow-Hart Wiring Devices.
- c. Or approved equal.
- B. Damp Locations and Corrosive Locations: Duplex grounding receptacle, corrosion resistant, two pole, three wire, 125 volt AC, 20 ampere.
  - 1. Product and Manufacturer: Provide one of the following:
    - a. Cat. #53CM62, by Harvey Hubbell Inc.
    - b. Cat. #5362-CR, by Arrow-Hart Wiring Devices.
    - c. Or approved equal.
- C. Ground Fault Circuit Interrupter Receptacles: Provide GFCI receptacles as shown on the Drawings. GFCI receptacles in unclassified areas shall be duplex grounding, two pole, three wire, 125 volt AC, 20 ampere.
  - 1. Product and Manufacturer:
    - a. Cat. #GF5362, by Harvey Hubbell Inc.
    - b. Cat. #GF5342, by Arrow-Hart Wiring Devices.
    - c. Or approved equal.
- D. Power and Special Receptacles: Provide receptacles with number of poles and voltage and current rating as shown on the Drawings. Coordinate with equipment plugs. Provide matching plug for each receptacle. Coordinate with cables provided with equipment.

### 3.1 INSTALLATION

- A. Install wiring devices in outlet or device boxes with device cover plates in accordance with Section 16134.
- B. Install receptacles with ground pole in the down position.

- C. Mount receptacles 18 inches above finished floor unless otherwise noted.
- D. Install in conformance with National Electrical Code.



### MOTOR STARTERS

### PART 1 - GENERAL

# 1.1 DESCRIPTION

A. Scope: Contractor shall furnish all labor, materials, equipment and incidentals required to provide individually mounted magnetic and manual motor starters as shown and specified.

# 1.2 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable, provisions, and recommendations of the following except where otherwise shown or specified.
  - 1. NEMA Standard ICS2, Industrial Control and Systems: Controllers, Contactors and Overload Relays Rated Not More Than 2,000 Volts AC or 750 Volts DC.
  - 2. UL Electrical Construction Materials Directory (NLDX).
  - 3. National Electrical Code.

### 1.3 SUBMITTALS

A. Shop Drawings: Submit for approval, copies of manufacturer's technical information for magnetic motor starters proposed for use.

### PART 2 - PRODUCTS

- A. Magnetic Motor Starters:
  - 1. Type: Magnetic coil operated, horsepower rated with thermal overload protection.
  - 2. Combination starter with magnetic only motor circuit protector.

# 3. Enclosures:

- a. NEMA 12 in dry locations.
- b. NEMA 4X stainless steel in damp locations.
- c. NEMA 4X polycarbonate in corrosive locations.
- 4. Functional Type: Full voltage, single speed, nonreversing unless otherwise noted on Drawings.
- 5. Start/stop control stations, selector switches, pilot lights and devices as shown on Drawings, and in Schematic Diagrams, for respective starters. Control Devices are specified in Section 16925.
- 6. Control power transformer with primary and secondary fuses and grounded on low voltage (120 v) side for each starter.
- 7. Auxiliary contacts for remote status signals and interlocks as shown on the Drawings, and two normally open, and two normally closed, spare contacts.
- 8. Three-phase, manual reset overload relays and overload heaters sized to coordinate with actual motors being controlled.
- 9. Engraved phenolic nameplate identifying the equipment controlled; 1/2-inch letters, mounted on wall or suitable support adjacent to starter, if too large to be mounted on the starter itself.
- 10. Products and Manufacturers: Provide one of the following:
  - a. A200 series by Cutler-Hammer.
  - b. Bulletin 512 by Allen Bradley.
  - c. Class 8539 by Square D Company.
  - d. Or approved equal.

### B. Manual Motor Starters:

1. Type: Manual toggle switch, horsepower rated with thermal overload protection.

### 2. Enclosures:

- a. NEMA 12 in dry locations.
- b. NEMA 4X stainless steel in damp locations.
- c. NEMA 4X polycarbonate in corrosive locations.
- 3. Manual reset overload relays and overload heaters sized to coordinate with actual motors being controlled.
- 4. Engraved phenolic nameplate identifying the equipment controlled: 1/2-inch letters, mounted adjacent to starters on wall or suitable support.
- 5. Products and Manufacturers: Provide one of the following:
  - a. Type B100 by Cutler-Hammer.
  - b. Class 2510 by Square D Company.
  - c. NFS series by Crouse Hinds (NEMA 4X)
  - d. Or approved equal.

### PART 3 - EXECUTION

# 3.1 INSTALLATION

- A. Mount equipment so that sufficient access and working space is provided for safe operation and maintenance.
- B. Securely fasten enclosure to wall or other mounting surfaces. Where local wall is not available, provide channel supports (galvanized steel in dry locations, stainless steel in damp and corrosive locations) to rigidly support equipment reasonably close to motor. Space starter enclosures 1/2 inch from mounting surface.

- C. Install in conformance with the National Electrical Code.
  - + + END OF SECTION + +

### LIGHTING AND DISTRIBUTION PANELBOARDS

### PART 1 - GENERAL

# 1.1 DESCRIPTION

A. Scope: Contractor shall furnish all labor, materials, equipment and incidentals required to provide lighting and distribution panelboards as shown and specified.

# 1.2 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable provisions and recommendations of the following except where otherwise shown or specified:
  - 1. NEC Article 408, Switchboards and Panelboards.
  - 2. UL 50, Standard for Enclosures for Electrical Equipment, Non-Environmental Considerations.
  - 3. UL 50E, Standard for Enclosures for Electrical Equipment, Environmental Considerations.
  - 4. UL 67, Standard for Panelboards.
  - 5. NEMA PB1, Panelboards.

### 1.3 SUBMITTALS

A. Shop Drawings: Submit for approval copies of manufacturer's technical information for panelboards, including circuit breakers, and schedules for particular panelboards.

### PART 2 - PRODUCTS

### 2.1 MATERIALS

## A. Panelboards:

1. Rating: voltage rating, current rating, number of phases, number of wires and number of poles shall be as indicated on the Schedules.

- 2. Circuit breakers: Molded case, thermal magnetic type with number of poles and trip ratings as shown on the Drawings. Ground fault circuit interrupter (GFI) breakers shall be furnished as shown on panelboard schedule (UL Class A 4-6 mA for receptacles and UL Class B 30 mA for heat trace cable).
- 3. Branch circuit interrupting capacity: Refer to panel schedules on Drawings.
- 4. Bus Bars: 98 percent conductivity copper. All 4-wire panelboards shall have a solid neutral bar. All panels shall have ground bus.
- 5. Main: Circuit breaker or main lugs only as indicated on the Schedules.
- 6. Branch circuit breakers connected for sequence phasing.
- 7. Construction: Ample gutter space, flush door, flush snap latch and lock. Panelboards shall be rated NEMA 12 in dry locations and NEMA 4X (stainless steel) in damp locations.
- 8. Trim: Surface as required to meet requirement of mounting.
- 9. Directory: Typed card with glass cover in frame on back of door giving the circuit numbers and the area or equipment served.
- 10. Identification: Nameplate identifying the panel number and voltage.
- 11. Product and Manufacturer: Provide one of the following:
  - a. 120/208 Volt and 120/240 Volt Panels:
    - 1) "Pow-R-Line 1" by Cutler Hammer.
    - 2) Or approved equal.
  - b. 480 Volt and 480/277 Volt Panels:
    - 1) "Pow-R-Line 3a" by Cutler Hammer.

- 2) Or approved equal.
- 12. Schedules: The panelboard schedules are on the Drawings.

### 3.1 INSTALLATION

- A. Mounting: Panelboards shall be flush mounted in the motor control center or surface mounted, and provided with hinged cover door with latch, lock, and 4 keys.
- B. Directory: Complete typewritten directory indicating items controlled by each circuit breaker and the size of feeder serving the panel. The location and identification of feeder overcurrent device serving the panel shall be mounted on the panelboard.
- C. Balance the loads on the panelboards.



### DISCONNECT SWITCHES

### PART 1 - GENERAL

### 1.1 DESCRIPTION

A. Scope: Contractor shall furnish all labor, materials, equipment and incidentals required to provide disconnect switches as shown and specified and as required by the National Electrical Code.

# 1.2 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable provisions and recommendations of the following except where otherwise shown or specified:
  - 1. National Electrical Code.
  - 2. UL 98, Standard for Enclosed and Dead-front Switches.
  - 3. NEMA KS1, Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

#### 1.3 SUBMITTALS

A. Shop Drawings: Submit for approval copies of manufacturer's technical information for disconnect switches proposed for use.

### PART 2 - PRODUCTS

- A. Disconnect Switches (Single Throw):
  - 1. Type: Unfused, service entrance equipment rated where applicable; horsepower rated, heavy-duty, single throw, two pole and three pole with visible blade and safety handle, lockable in the open position.

- 2. Enclosure: NEMA 12 for dry locations, NEMA 4X stainless steel for damp locations and NEMA 4X fiberglass for corrosive areas.
- 3. Provide nameplate identifying equipment being disconnected.
- 4. Product and Manufacturer: Provide material manufactured by one of the following:
  - a. Crouse-Hinds Company.
  - b. Appleton Electric Company.
  - c. Square D.
  - d. Or approved equal.
- B. Disconnect switch voltage ratings shall be suitable for equipment served.

### 3.1 INSTALLATION

- A. Mount equipment so that sufficient access and working space is provided for ready and safe operation and maintenance. Mount all disconnect switches four feet above floor level.
- B. Securely fasten equipment to walls or other structural surfaces on which they are mounted. Provide independent supports (galvanized steel in dry locations, stainless steel in damp and corrosive locations) where no wall or other structural surface exists.
- C. Furnish and install disconnect switches where shown on the drawings.
- D. Furnish and install disconnect switches, as a minimum, in all locations required by the National Electrical Code.

### POWER DISTRIBUTION SYSTEM STUDIES

# PART 1 - GENERAL

### 1.1 SECTION INCLUDES

- A. Power system studies shall be provided in accordance with the requirements specified under this section.
- B. The power system studies shall consist of a short circuit analysis, protective device coordination analysis and arc-flash hazard analysis. The studies shall address the new power distribution system and equipment furnished under this project. This includes the main circuit breaker and panelboards.

## 1.2 REFERENCES

- A. The power distribution system coordination shall comply with the latest applicable provisions and recommendations of the following:
  - 1. NFPA 70 National Electrical Code
  - 2. ANSI Standard C37.04 Rating Structure for AC High Voltage Circuits Rated on a Symmetrical Basis
  - 3. ANSI Standard C37.010 Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Basis
  - 4. IEEE 141 Recommended Practice for Electric Power Distribution in Industrial Plants
  - 5. IEEE 399 Recommended Practice for Industrial and Commercial Power System Analysis

## 1.3 SUBMITTALS

- A. Contractor shall submit the short circuit and protective device coordination studies for approval as follows:
  - 1. Calculations and results of the power system studies shall be submitted. The short circuit study, protective device evaluation and coordination studies shall be submitted in a report format. The report shall be stamped and signed by a Licensed Professional Engineer.
  - 2. Qualifications of proposed firm to provide the power system studies.

## 1.4 QUALITY ASSURANCE

## A. General:

- 1. The power system studies shall be performed in accordance with the latest applicable provisions and recommendations of the following:
  - a. NFPA 70, National Electrical Code
  - b. ANSI C37.04
  - c. ANSI C37.010
  - d. IEEE 141
  - e. IEEE 399
- 2. The Contractor shall retain the services of a Professional Engineer, licensed in the State of New York, to perform the power system studies.
- 3. The Contractor shall coordinate with the Engineer performing the studies and assist him in the collection of all information necessary to complete the studies specified.
- 4. All test equipment and instrument calibration shall be in accordance with the latest edition of the accuracy standard of the U.S. National Institute of Standards and Technology and the NETA maintenance testing specification.

### PART 2 - PRODUCTS

### 2.1 POWER SYSTEM STUDIES

### A. General:

- 1. The Contractor shall provide a current and complete short-circuit study, protective device coordination study and arc flash hazard analysis for the electrical distribution system.
- 2. The studies shall include all portions of the electrical distribution system from the O&R transformer and panelboard.
- 3. Problem areas or equipment inadequacies shall be promptly brought to the Engineer's attention.

# B. Short Circuit Study:

- 1. The short circuit study shall be performed with the aid of a computer program.
- 2. The study input data shall include the utility company's short circuit, single and three phase contributions, with the X/R ratio, the resistance and reactance components of each branch impedance, motor and generator contributions, base quantities selected, and all other applicable circuit parameters.
- 3. Short-circuit momentary duties and interrupting duties shall be calculated on the basis of maximum available fault current at each switchgear bus, switchboard, motor control center, distribution panelboard, pertinent branch circuit panelboards, and other significant locations through the system.
- 4. The short circuit tabulations shall include symmetrical fault currents, and X/R ratios. For each fault location, the total duty on the bus, as well as the individual contribution from each connected branch, including motor back EMF current contributions shall be listed with its respective X/R ratio.

- C. Protective Device Coordination Study:
  - 1. A protective device coordination study shall be performed to select or to check the selections of the power fuse ratings, protective relay characteristics and settings, ratios and characteristics of associated voltage and current transformers, and low-voltage breaker trip characteristics and setting.
  - 2. The overcurrent device settings computed in the coordination study shall provide complete 100 percent selectivity. The system shall be selectively coordinated such that only the device nearest a fault will operate to remove the faulted circuit. System selectively shall be based on both the magnitude and the duration of a fault current.
  - 3. The coordination study shall include all voltage classes of equipment starting at the utility's incoming line protective device down to and including each of the medium and low voltage equipment. The phase and ground overcurrent and ground fault protection shall be included, as well as settings for all other adjustable protective devices.
  - 4. The time-current characteristics of the installed protective devices shall be plotted on the appropriate log-log paper. Reasonable coordination intervals and separation of characteristic curves shall be maintained. The coordination plots for phase and ground protective devices shall be provided on a complete system basis. Sufficient curves shall be used to clearly indicate selective coordination achieved to the utility main breaker, power distribution feeder breakers, and the overcurrent devices at each major load center.
  - 5. There shall be a maximum of eight protective devices per plot. Each plot shall be appropriately titled. Plots shall include the following information as required for the circuits shown:
    - a. Representative one-line diagram, legends and types of protective devices selected.

- b. Power company's relays or fuse characteristics.
- c. Significant motor starting characteristics.
- d. Parameters of transformers, ANSI magnetizing inrush and withstand curves.
- e. Operating bands of low voltage circuit breaker trip curves, and fuse curves.
- f. Relay taps, time dial and instantaneous trip settings.
- g. Cable damage curves.
- h. Symmetrical and asymmetrical fault currents.
- 6. The selection and settings of the protective devices shall be provided separately in a tabulated form listing circuit identification, IEEE device number, current transformer ratios, manufacturer, type, range of adjustment, and recommended settings. A tabulation of the recommended power fuse selection shall be provided for all fuses in the system.

## D. Arc-Flash Hazard Analysis

- 1. The Arc-Flash Hazard Analysis shall be performed with the aid of computer software intended for this purpose in order to calculate Arc-Flash Incident Energy (AFIE) levels and flash protection boundary distances.
- 2. The Arc-Flash Hazard Analysis shall be performed in conjunction with a short-circuit analysis and a time-current coordination analysis.
- 3. Results of the Analysis shall be submitted in tabular form, and shall include device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, personal-protective equipment classes and AFIE levels.
- 4. The analysis shall be performed under worst-case Arc-Flash conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.

- 5. The Arc-Flash Hazard Analysis shall be performed by a registered professional engineer.
- 6. The Arc-Flash Hazard Analysis shall be performed in compliance with IEEE Standard 1584-2002, the IEEE Guide for Performing Arc-Flash Calculations.
- 7. The Arc-Flash Hazard Analysis shall include recommendations for reducing AFIE levels and enhancing worker safety.

### 2.2 STUDY REPORT

- A. The results of the power system study shall be summarized in a final typewritten report. The report shall include the following Sections:
  - 1. Description, purpose, basis, written scope, and a single-line diagram of the power distribution system which is included within the scope of the study.
  - 2. Tabulations of circuit breaker, fuses, and other equipment ratings versus calculated short-circuit duties, and commentary regarding same.
  - 3. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.
  - 4. Fault current tabulation including a definition of terms and a guide for interpretation.
  - 5. Tabulation of appropriate tap settings for relay seal-in units.
  - 6. Incident energy and flash protection boundary calculations, including the following: racing fault magnitude; protective device clearing time; duration of arc; working distance; incident energy; hazard risk category; recommendations for arc flash energy reduction; and recommendations for the Personal Protective Equipment (PPE).

### 3.1 FIELD TESTING

A. Coordinate findings of the short circuit study and protective device coordination study with the electrical distribution equipment.

### 3.2 ARC FLASH WARNING LABELS

- A. The Contractor shall provide a 3.5-inch by 5-inch thermal transfer type label of high adhesion polyester for each work location analyzed.
- B. All labels shall be based on recommended overcurrent device settings and shall be provided after the results of the analysis have been presented to the Engineer and after any system changes, upgrades, or modifications have been incorporated in the system.
- The label shall include the following information, at a minimum: location designation; nominal voltage; flash protection boundary; hazard risk category; incident energy; working distance; and engineering report number, revision number and issue date.
- D. Labels shall be machine printed with no field markings.
- E. Arc flash labels shall be provided in the following manner, and all labels shall be based on the recommended overcurrent device settings:
  - 1. For each panelboard, one arc flash label shall be provided.
  - 2. For each motor control center, one arc flash label shall be provided.
  - 3. Labels shall be field installed by the approved firm performing the arc flash hazard analysis study.

## 3.3 ARC FLASH TRAINING

A. The Professional Engineer performing the arc flash analysis shall train the Owner's personnel of the potential arc flash hazards associated with working on energized equipment.



### UNDERGROUND DUCT BANKS

### PART 1 - GENERAL

### 1.1 DESCRIPTION

A. Scope: Contractor shall furnish all labor, materials, equipment and incidentals required to provide underground duct banks as shown and specified.

### B. Coordination:

- 1. Duct bank routing on the Drawings is diagrammatic. Coordinate installation with piping, sheet piling and other underground systems and structures and locate clear of interferences.
- 2. Refer to plans for areas of sheeting and excavation and the Contractor's sequence of construction. Contractor shall schedule his work on duct banks in these areas to run concurrently with that of other trades.
- 3. The Contractor shall be responsible for excavation, backfilling, curbing removal and replacement, and surface restoration to match existing conditions. Truck vehicle access (H-20 loading) shall be maintained during construction.

# C. Related Work Specified Elsewhere:

- 1. Division 1, General Requirements.
- 2. Site work shall conform to the requirements of Division 2, Site Work.
- 3. Concrete work shall conform to the requirements of Division 3, Concrete.
- 4. Section 16111, Conduit.
- 5. Section 16404, Manholes and Handholes.

# 1.2 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable provisions and recommendations of the following except where otherwise shown or specified:
  - 1. National Electrical Code.
  - 2. National Electrical Safety Code.
- B. Record Drawings: Include the actual routing of underground duct runs on record drawings as specified under Division 1, General Requirements, and General and Special Conditions.

### 1.3 SUBMITTALS

- A. Shop Drawings: Submit the following for approval:
  - 1. Layouts showing proposed routing of duct banks and the locations of hand holes and crossings with piping and other underground structures.
  - 2. Typical cross sections.
  - 3. Installation procedures.

### PART 2 - PRODUCTS

- A. Duct:
  - 1. Schedule 40 PVC conduit and fittings in accordance with Section 16111.
- B. Backfill: Select backfill in accordance with Division 2, Site Work.
- C. Concrete: In accordance with Division 3, Concrete.

# 3.1 INSTALLATION

- A. Make duct bank installation and penetrations through foundation walls watertight.
- B. Provide excavation and backfilling required for duct bank installation. Where duct banks cross paved areas, maintain vehicle access for H-20 loading.
- C. Assemble duct banks using nonmagnetic saddles, spacers and separators. Position separators to provide minimum concrete separation between the outer surfaces of the ducts as shown on the Drawings. Provide side forms for each duct bank.
- D. Provide a 2-inch minimum concrete cover on top of conduits, unless otherwise shown.
- E. Make bends with sweeps of not less than 48-inch radius or 5 degree angle couplings.
- F. Where ducts enter structures such as service cabinet compartments, terminate the ducts in suitable radius bell end fittings or bushings and provide watertight expansion/deflection fittings.
- G. Slope duct runs for drainage away from buildings with a slope of approximately 3 inches per 100 feet.
- H. After completion of the duct bank and prior to pulling cable, pull a mandrel, not less than 12 inches long and with a cross section approximately one-fourth inch less than the inside cross section of the duct, through each duct. Then pull a rag swab or sponge through to make certain that no particles of earth, sand or gravel have been left in the duct.
- I. Install a warning ribbon approximately 12 inches below finished grade over all underground duct banks. The identifying ribbon shall be a polyvinyl chloride tape, 6 inches wide, yellow color, permanently imprinted with "CAUTION BURIED ELECTRIC LINE BELOW" in black letters.
- J. Plug and seal watertight all empty spare ducts entering buildings and structures. Seal watertight all ducts in use entering buildings and structures.

- K. Contractor shall employ an experienced photographer to photograph underground electrical installations prior to backfilling. Pictures shall not be less than 7-1/2 in. by 9-1/2 in. in size and shall be cloth mounted. Photographs shall be labeled to identify:
  - 1. Conduit sizes.
  - 2. Conduit identification number, label, etc., (conform to record drawing identification).
  - 3. Service(s).
  - 4. Manhole numbers, handhole numbers.
  - 5. Locations referenced to structures, roadways, etc.

Three copies of each photograph shall be submitted to the Engineer.

## MANHOLES AND HANDHOLES

#### PART 1 - GENERAL

## 1.1 DESCRIPTION

- A. Scope: Contractor shall furnish all labor, materials, equipment and incidentals required to provide manholes and handholes as shown and specified.
- B. Coordination: Coordinate handhole installation with piping, sheet piling and other underground systems and structures and locate clear of interferences.
- C. Related Work Specified Elsewhere:
  - 1. Site work shall conform to the requirements of Division 2, Site Work.
  - 2. Concrete work shall conform to the requirements of Division 3, Concrete.
  - 3. Division 5, Metals.
  - 4. Section 16402, Underground Duct Banks.

# 1.2 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable provisions and recommendations of the following except where otherwise shown or specified:
  - 1. National Electrical Code.
  - 2. National Electrical Safety Code (ANSI C2).
  - 3. ASTM A48, Standard Specification for Gray Iron Castings.
  - 4. OSHA.

# 1.3 SUBMITTALS

- A. Shop Drawings.
- B. Submit for approval copies of manufacturer's technical information for handholes and accessories proposed for use, including handhole castings, cable racks and accessories proposed for use.

## PART 2 - PRODUCTS

## 2.1 MANHOLES AND HANDHOLES

A. Material and Construction: Cast-in-place reinforced concrete shall meet the requirement of Division 3, Concrete.

#### B. Accessories:

- 1. Frames and Covers:
  - a. Material: Cast iron.
  - b. Covers shall be watertight and gasketed.
  - c. Covers shall be marked "ELECTRIC" in raised two inch letters.
  - d. Frame shall be grouted on the handhole.
  - e. Rated for H20 loading.
  - f. Product and Manufacturer: Provide one of the following:
    - 1) Campbell Foundry (Harrison, New Jersey), refer to manhole and/or handhole details on Drawings for model number.
    - 2) Or approved equal.

# PART 3 - EXECUTION

# 3.1 INSTALLATION

- A. Install manholes and handholes where shown on Drawings. Verify final locations in field. Contractor shall be responsible for all excavation, backfilling and all other site work required for installation.
- B. Complete installation of handholes so that structures are watertight.
- C. Provide dewatering operations as required during construction of the handholes and ductbank system.
- D. The minimum interior dimensions shall be as indicated on the drawings.
- E. Duct entrances shall be sized and located to suit duct banks.



## GROUNDING SYSTEM

## PART 1 - GENERAL

## 1.1 DESCRIPTION

- A. Scope: Contractor shall furnish all labor, materials, equipment and incidentals required to provide a complete new grounding system for the new facilities and equipment as shown, specified and required by the National Electrical Code.
- B. Related Work Specified Elsewhere:
  - 1. Division 2, Site Work.

# 1.2 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable provisions and recommendations of the following except where otherwise shown or specified:
  - 1. NEC Article 250, Grounding and Bonding.
  - 2. UL 467, Standard for Grounding and Bonding Equipment.

## 1.3 SUBMITTALS

- A. Shop Drawings: Submit for approval copies of manufacturer's technical information for grounding materials proposed for use.
- B. Test Data: Submit for approval results of ground resistance testing.

## PART 2 - PRODUCTS

## 2.1 MATERIALS

- A. Bare Ground Cable:
  - 1. Material: Annealed, bare, stranded copper, No. 4/0 AWG minimum size unless specifically noted otherwise.
  - 2. Manufacturers: Provide material manufactured by one of the following:
    - a. Wire and Cable Division of Anaconda Company.
    - b. General Cable Corporation.
    - c. Or approved equal.
- B. Ground Rods, Material: Copperclad steel rods, 3/4-inch diameter, 10 feet long, unless otherwise noted on the Drawings. Heary Bros, cat #HB107-GR or equal.
- C. Grounding Connectors:
  - 1. Material: Pressure connectors to be copper alloy castings, designed specifically for the items to be connected, and assembled with Durium or silicone bronze bolts, nuts and washers. Welded connections to be by exothermic process utilizing molds, cartridges and hardware designed specifically for the connection to be made.
  - 2. Product and Manufacturer: Provide material manufactured by one of the following:
    - a. Pressure Connectors:
      - 1) Burndy Corporation.
      - 2) O-Z/Gedney, Division of General Signal Corporation.
      - 3) Or approved equal.
    - b. Welded Connections:
      - 1) Cadweld by Erico Products, Incorporated.

- 2) Therm-O-Weld by Burndy Corporation.
- 3) Or approved equal.

# PART 3 - EXECUTION

## 3.1 FACILITY GROUND SYSTEM

- A. Install ground rods in locations shown on the drawings to provide a resistance to ground of less than 5 ohms.
- B. Weld all buried connections. Buried bolted connections are not permitted.
- C. Provide accessible test points for measuring the ground resistance of ground grids.
- D. Coordinate all work with site work by other trades.
- E. Ground new electrical services in accordance with NEC requirements.

# 3.2 EQUIPMENT GROUNDING

- A. Ground all electrical equipment in compliance with the National Electrical Code.
- B. Equipment grounding conductors shall be bare stranded copper cable of adequate size installed in metal conduit where necessary for mechanical protection.
- C. Connect ground conductors to conduit with copper clamps, straps or with grounding bushings.
- D. Connect to piping by welding or brazing. Use copper bonding jumpers on all gasketed joints.
- E. Connect to equipment by means of lug compressed on cable end. Bolt lug to equipment frame using holes or terminals provided on equipment specifically for grounding. Do not use hold-down bolts. Where grounding provisions are not included, drill suitable holes in locations designated by the Engineer.
- F. Connect to motors by bolting directly to motor frames, not to sole plates or supporting structures.

- G. Connect to service water piping by means of copper clamps. Use copper bonding jumpers on all gasketed joints.
- H. Scrape bolted surfaces clean and coat with a conductive oxide resistant compound.

## 3.3 TESTING

A. Test the complete ground systems for continuity and for resistance to ground of less than five ohms using an electrical ground resistance tester. Furnish certified report to Engineer.

## LIGHTING FIXTURES

## PART 1 - GENERAL

# 1.1 DESCRIPTION

- A. Scope: Contractor shall furnish all labor, materials, equipment and incidentals required to provide lighting fixtures as shown and specified.
- B. Coordination: Coordinate location of fixtures with piping, ductwork, openings and other systems and equipment and locate clear of interferences.
- C. Related Work Specified Elsewhere:
  - 1. Section 16111, Conduit.
  - 2. Section 16134, Outlet Boxes.
  - 3. Section 16140, Switches.

# 1.2 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable provisions and recommendations of the following except where otherwise shown or specified:
  - 1. National Electrical Code.
  - 2. UL 1598, Standard for Luminaires.

## 1.3 SUBMITTALS

A. Shop Drawings: Submit for approval copies of manufacturer's technical information for lighting fixtures, including ballasts.

# 1.4 SPARE PARTS

A. LED Fixtures: One of each fixture type required.

# PART 2 - PRODUCTS

# 2.1 MATERIALS

- A. Type: Fixtures to be complete with supports, lamps and incidentals as required.
- B. Hardware: All necessary hangers, supports, conduit adaptors, reducers, hooks, brackets and other hardware required for safe fixture mounting shall be furnished. Hardware shall be stainless steel.
- C. Schedule: The lighting fixtures shall be provided in accordance with the following schedule:

Type	General Description	Lamps	Mfgr & Cat No
А	Recessed-mounted LED	LED (4000K,	Cooper Lighting
	fixture, galvanized steel	1060 lumens at	HC4-10-D010-REM7-
	plaster frame, rotatable	9.9 Watts)	RMB22-HM4-0525-
	linear spread lens, 80		835-41-MD-W or
	CRI, 120-277V.		approved equal.
В	Wall-mounted LED fixture,	LED (3000K,	Progress Lighting
	die-cast aluminum wall	2040 lumens at	P563001-030-30K or
	brackets, heavy-duty	48 Watts)	approved equal.
	aluminum framing, clear		
	glass lens, white finish,		
	90 CRI.		
С	LED fixture, die-cast	LED (4000K,	RAB Lighting
	aluminum housing, lens	6827 lumens at	ALED-2T-50-N or
	frame, 72 CRI	55 Watts)	approved equal.
	Pole: 4" square straight		RAB Lighting
	steel, 11 gauge		PS4-11-15D2

<sup>\*\*</sup>Fixture color by Owner

# PART 3 - EXECUTION

# 3.1 INSTALLATION

- A. General: Fixture mounting heights and locations indicated on the Drawings are approximate and are subject to revision in the field where necessary to clear conflicts and obstructions.
- B. Suspended Fixtures: Pendant mount using 1/2-inch conduit stems. Ground to outlet box. Attach mounting to building structure with expansion anchors.

- C. Surface Mounted Fixtures: Attach to appropriate outlet box.
- D. Boxes and Fixtures:
  - 1. For units mounted against masonry or concrete walls, provide suitable 1/2-inch spacers to prevent mounting back of box directly against wall.
  - 2. Bolt units rigidly to building with expansion anchors, toggle bolts, hangers or Unistrut.
  - 3. No boxes shall be installed with open conduit holes.
  - 4. Cable each circuit and identify with tag.
- E. Mounting Heights: Mounting heights or elevations are to bottom of the fixture or to centerline of device.
- F. Install fixtures in conformance with the National Electrical Code.



## CONTROL STATIONS

#### PART 1 - GENERAL

# 1.1 DESCRIPTION

A. Scope: Contractor shall furnish all labor, materials, equipment and incidentals required to provide pushbuttons, selector switches, thermostats and other control stations as shown and specified.

# 1.2 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable provisions and recommendations of the following except where otherwise shown or specified:
  - 1. NEMA ICS 5, Control Circuit and Pilot Devices.

#### 1.3 SUBMITTALS

A. Shop Drawings: Submit for approval copies of manufacturer's technical information for control stations proposed for use.

## PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Control Stations:
  - 1. Type: Industrial, heavy duty, oil tight construction with clearly marked legend plates.
  - 2. Pushbuttons: Momentary or maintained types as shown on the Drawings. NEMA A600 contact rating.
  - 3. Lock-out Stop: Two push-button maintained contact type with locking feature.
  - 4. Selector Switches: Rotary type with round or oval handles and positioning device to securely hold switch in selected position.

- a. Hand-off-auto switches at motor locations shall have additional contact blocks for hand and auto position status at local panels, as indicated on the Contract Drawings.
- b. Jog-auto-off switches shall be spring return to off from jog.
- 5. Indicating Lights: Transformer type with 6 volt lamp. Lens color green for running, red for stopped, ready or failure, push to test.
- 6. Enclosures: NEMA 12 cast iron for dry locations, NEMA 4X stainless steel for damp locations and NEMA 4X fiberglass for corrosive locations.
- 7. Certain additional features for individual control stations shall be provided as indicated on the Contract Drawings or on the Schematic Diagrams.
- 8. Product and Manufacturer: Provide equipment manufactured by one of the following:
  - a. Square D.
  - b. General Electric Company.
  - c. Allen Bradley.
  - d. Crouse-Hinds Company.
  - e. Appleton Electric Company.
  - f. Or approved equal.

### B. Thermostats:

- 1. Construction: Rugged NORYL plastic, NEMA 4X rated. Exposed portion of the liquid-filled sensing elements shall be plated and plastic coated to resist damage in corrosive atmospheres.
- 2. Range:  $30^{\circ}$  to  $110^{\circ}$ F with a differential of  $3^{\circ}$  to  $12^{\circ}$ F.
- 3. Contact: Output shall be single pole double throw switch rated 16.0 AC full load amperes motor load, 96 locked rotor amperes at 120 volts AC.

4. Products and Manufacturers" Provide one of the following: Johnson Controls Model A19PRC-1C, or approved equal.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Mount equipment so that sufficient access and working space is provided for safe operation and maintenance.
- B. Securely fasten equipment to walls or other surfaces on which they are mounted. Provide independent supports (galvanized steel in dry locations, stainless steel in damp and corrosive locations) where no wall or other surface exists.



# DIVISION 18 - PLUMBING



#### GENERAL PROVISIONS

#### PART 1 - GENERAL

#### 1.1 DESCRIPTION

A. Scope: The Contractor shall furnish all labor, materials, equipment and incidentals required to complete the plumbing work as shown and specified. The scope of work for the Plumbing Contract is defined in Section 01010, Summary of Work.

#### B. Coordination:

- 1. Review installation procedures under other Sections of these specifications and coordinate the installation of items that must be installed with the site work, building construction work, formwork, walls, partitions and ceilings.
- 2. Coordinate the plumbing work with the work by others.
- 3. Specific additional coordination requirements are outlined in Section 01010, Summary of Work.

### C. General:

- 1. Dimensions shown on the Drawings that are related to equipment are based on one manufacturer's equipment. Coordinate the dimensions of the equipment furnished with the space allocated for that equipment.
- 2. The Drawings show the principal elements of the plumbing installation. They are not intended as detailed working drawings for the plumbing work but as a complement to the Specifications to clarify the principal features of the plumbing systems.
- 3. It is the intent of this Section that all piping and valves, furnished and installed under this and other Sections, be properly connected and interconnected with other equipment so as to render the installations complete for successful operation,

- regardless of whether all the connections and interconnections are specifically mentioned in the Specifications or shown on the Drawings.
- 4. Mounting heights of piping and valves noted in the Specifications and on the Drawings are to the center of the device.
- 5. Review the Contract Drawings for areas of sheeting and excavation specified under other sections of the Contract. Contractor shall schedule their work on underground piping and valves in these areas to run concurrently with that of the site work.
- 6. The Contractor shall be responsible for excavation, backfilling, bedding, curbing removal and replacement, concrete encasement, and surface restoration, including pavement for underground piping, valve installation and other work related to this Contract that disturbs existing conditions, equipment, improvements and facilities. Truck vehicle access (H-20 loading) shall be maintained on facility roads during construction.
- D. Related Work Specified Elsewhere:
  - 1. Division 1, Special Conditions
  - 2. Division 5, Metals
  - 3. Division 9, Finishes
  - 4. Division 15, Mechanical
- E. Work Included But Specified Elsewhere:
  - 1. Anchor bolts and other fasteners shall conform to requirements of Division 5, Metals.
  - 2. Shop painting and surface preparation shall conform to requirements of Division 9, Finishes.
- F. Temporary Power: Temporary light and power for construction purposes shall be provided in accordance with Division 1, Special Conditions.

# 1.2 QUALITY ASSURANCE

- A. Reference Standards: Plumbing material and equipment shall conform in all respects to the latest approved standards of the following:
  - 1. American Society for Testing and Materials (ASTM).
  - 2. The American National Standards Institute (ANSI).
  - 3. American Water Works Association (AWWA).
  - 4. Occupational Safety and Health Administration (OSHA).
  - 5. Orange County Department of Health.

#### 1.3 SUBMITTALS

- A. General: Conform to requirements of the General Specifications and Special Conditions.
- B. Shop drawings shall include the following information to the extent applicable to the particular item:
  - 1. Manufacturer's name and product designation or catalog number.
  - 2. Pressure ratings.
  - 3. Conformance to applicable standards or specifications of ANSI, ASTM, AWWA, NFPA, OSHA, UL, or other organizations.
  - 4. Dimensioned plan, section, and elevations showing means for mounting, piping connection and valves.
  - 5. Materials and finish specification, including paints.
  - 6. List of components including manufacturer's names and catalog numbers.
  - 7. Manufacturer's instructions and recommendations for installation, operation, and maintenance.
  - 8. Manufacturer's recommended list of spare parts.

## 1.4 PROJECT CLOSE-OUT

A. Operation and Maintenance Data: Conform to requirements of Division 1 and the General and Special Conditions.

## 1.5 PRODUCT DELIVERY

- A. Delivery of Materials: Contractor shall instruct the manufacturers and vendors as to the maximum shipping sizes of equipment that can be accommodated at the site.
- B. Storage: Plumbing equipment and material shall be stored and protected in accordance with Division 1 and General and Special Conditions.

## 1.7 PROCEDURES FOR INSTALLATION

- A. The Contractor is cautioned to perform their work with due regard to safety and in a manner that will not interfere with the existing equipment or in any way cause interruption of any of the functions of the facility.
- B. No existing equipment or piping shall be removed without the specific direction and approval of the Owner, and without clearance by appropriate representatives of the Owner. Whenever such work is contemplated, the Contractor shall submit to the Owner a written request for scheduling such work. Written request must be received 5 working days prior to the date on which the proposed work is to be performed.

#### BURIED PIPING INSTALLATION

#### PART 1 - GENERAL

# 1.1 SUMMARY

# A. Scope:

- 1. The Contractor shall furnish all labor, materials, equipment and incidentals as shown on the Contract Drawings, specified and required to furnish, install and test all buried piping, fittings, specials and appurtenances. The Work includes, but is not limited to, the following:
  - a. All types and sizes of buried piping, except as specified under other Sections. These include, but are not limited to: ductile iron, carbon steel, copper, and thermoplastic.
  - b. Supports, restraints, and thrust blocks.
  - c. Testing.
  - d. Cleaning and disinfecting.
  - e. Also included are installation of all jointing and gasketing materials, specials, couplings, flexible couplings, sleeves, tie rods, corrosion protection, and all other Work required to complete buried piping installation.
  - f. All valves, specials, sleeves and wall pipes shown or specified shall be incorporated into the piping system as required and as specified in the appropriate section of Division 18.
  - g. Unless otherwise shown or specified, buried piping installation includes all buried piping Work required, beginning at the outside face of structure or building foundation.

2. Piping less than 4-inch in diameter is specified in Section 18068, but shall conform to applicable requirements of Section 18051.

## B. Coordination:

- 1. Review installation procedures under other Sections and coordinate with the Work that is related to this Section, including concrete, valves, ventilation and electrical.
- 2. Section 18051 specifies the installation of all buried piping materials specified in Division 18. Coordinate with these Sections.

# C. Related Work Specified Elsewhere:

- 1. Section 02200 Earthwork.
- 2. Section 03300, Cast-In-Place Concrete.
- 3. Section 09900, Painting. (Surface preparation and shop priming are under specific piping sections.)
- 4. Division 18, Sections on Piping, Valves and Appurtenances.
- 5. All piping specifically included with equipment.

# 1.2 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
  - 1. Comply with applicable requirements of UL and other authorities having jurisdiction.
- B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:
  - 1. ASTM D 2774, Underground Installation of Thermoplastic Pressure Piping.
  - 2. AWWA C111 (ANSI A21.11), Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

- 3. AWWA C600, Installation of Ductile-Iron Mains and Their Appurtenances.
- 4. AWWA C651, Disinfecting Water Mains.
- 5. AWWA M23, PVC Pipe Design and Installation.
- 6. NFPA 54, National Fuel Gas Code.

#### 1.3 SUBMITTALS

- A. Shop Drawings: Submit for approval Shop Drawings showing the following:
  - 1. Laying schedules and detailed drawings in plan and profile for all piping.
  - 2. Full details of piping, valves, specials, joints, harnessing and connections to pipes and structures.
- B. Tests: Submit description of proposed testing methods, procedures and apparatus. Submit copies of all test results.
- C. Certificate: Submit certificate of compliance with referenced standards.
- D. Record Drawings: Submit in accordance with the requirements of Section 01720, Project Record Documents.

# 1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Handle all pipe, fittings and accessories carefully with approved handling devices. Do not drop or roll pipe off delivery vehicle. Do not otherwise drop, roll or skid pipe. Materials cracked, gouged, chipped, dented or otherwise damaged will not be approved.
- B. Store pipe and fittings on heavy wood blocking or platforms so they are not in contact with the ground.
- C. Pipe, fittings and specials shall be unloaded and stored in areas designated on the drawings. Interiors shall be kept completely free from dirt and foreign matter.
- D. No material furnished under this specification shall be shipped to the job site until all submittals have been approved.

## PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Pipe bedding and backfill in accordance with Section 02200 Earthwork.
- B. Pipe materials required are listed in the Piping Schedules at the end of this section. The applicable Sections of Division 18 for detailed materials Specifications apply.

# C. Pipe Marking:

- 1. Each piece of pipe and fitting shall be clearly marked with a designation which shall conform with designations shown on the Shop Drawings.
- 2. Class designation shall be cast or painted on each piece of pipe or fitting 4 inches in diameter and larger.
- Piping smaller than 4 inches in diameter shall be clearly marked by manufacturer as to material, type and rating.

#### 2.2 BURIED PIPING SCHEDULE

A. Attached at the end of this Division is the "Buried Piping Schedule." Conform to requirements of the schedule, unless otherwise specified or approved by the Engineer.

## PART 3 - EXECUTION

## 3.1 INSTALLATION

## A. General:

- 1. All piping shall be sloped to avoid high spots and low spots and to facilitate drainage.
- 2. Proper and suitable tools and appliances for the safe, convenient handling and laying of pipe shall be used.

- 3. Install piping as shown on the Contract Drawings, specified and as recommended by the manufacturer.
- 4. Request instructions from Engineer before proceeding if there is a conflict between the manufacturer's recommendations and the Contract Drawings or Specifications.
- 5. Pipe, fittings and accessories that are cracked, damaged or in poor condition or with damaged linings will be rejected. At the time of laying, the pipe shall be examined carefully for defects, and should any pipe be discovered to be defective after being laid, it shall be removed and replaced with sound pipe by the contractor at their expense.
- 6. Minimum cover over buried piping shall be 4 feet unless otherwise shown or approved by Engineer.
- 7. Earthwork required is specified in Section 02200.

# B. Bedding Pipe:

- 1. Bed pipe with materials as specified below and as shown on the Contract Drawings.
  - a. Trenches shall not be excavated below the pipe bottom. All loose and unsuitable material shall be removed from the trench bottom and backfilled with compacted select fill.
  - b. Pipe embedment material shall be Select Fill or as defined on the Contract Drawings and placed in accordance with the requirements of Section 02200, Earthwork.
  - c. Pipe embedment shall be placed in maximum 6-inch layers and compacted for the full width of the trench. Recesses in the embedment shall be provided around each joint to allow space for making joints and inspection.
- 2. Carefully and thoroughly compact all pipe bedding and fill.
- 3. No piping shall be laid until Engineer approves the bedding condition.

4. No pipe shall be brought into position until the preceding length has been bedded and secured in its final position.

# C. Laying Pipe:

- 1. Conform to manufacturer's instructions and to AWWA C600, and AWWA M23 where applicable.
- 2. Install in accordance with the approved drawings unless otherwise approved by Engineer. Remove all pipe accurately to line and grade shown and relay pipes that are not laid correctly.
- 3. Slope piping uniformly between elevations given.
- 4. Ensure that water level in trench is at least 6 inches below bottom of pipe. Do not lay pipe in water. Maintain dry trench until jointing and backfilling are complete.
- 5. Start laying pipe at lowest point and proceed towards the higher elevations, unless otherwise approved by Engineer.
- 6. Place bell and spigot pipe so that bells face upstream unless otherwise approved by Engineer.
- 7. Excavate around joints in bedding and lay pipe so that only the barrel receives bearing pressure from the trench bottom.
- 8. Permissible deflections at joints shall not exceed 75 percent of the amount allowed by manufacturer and in no case exceed AWWA standards.
- 9. Prior to laying pipe, every precaution shall be taken to ensure that no foreign material enters the piping.
- 10. All pipe and fittings shall be carefully examined for cracks, damage or other defects while suspended above the trench, before installation. Defective materials shall be immediately removed from site.
- 11. Interior of all pipe and fittings shall be inspected and all dirt, gravel, sand, debris or other foreign material shall be completely removed from pipe interior before it is moved into the trench. Bell

- and spigot mating surfaces shall be thoroughly wire brushed and wiped clean and dry immediately before pipe is laid.
- 12. Every time that pipe laying is not actively in progress the open ends of pipe shall be closed by a watertight plug.
- 13. Field cutting pipe, where required, shall be made with a machine specially designed for cutting piping. Cuts shall be carefully done, without damage to pipe or lining, so as to leave a smooth end at right angles to the axis of pipe. Cut ends shall be tapered and sharp edges filed off smooth. Flame cutting will not be allowed.
- 14. Blocking under piping shall not be permitted unless specifically excepted by Engineer for special conditions. If permitted, conform to requirements of AWWA C600.
- 15. Repair protective coatings and linings in a satisfactory manner prior to backfilling. Refer to specific pipe specifications for coating systems required.

# D. Jointing Pipe:

- 1. Clean completely all jointing surfaces and adjacent areas immediately before making joint.
- Lubricate and adjust gaskets and "O"-rings as recommended by manufacturer.
- 3. After "O"-rings are compressed and before pipe is brought fully home, each gasket shall be carefully checked for proper position around full circumference of the joint.
- 4. Conform to AWWA C111 and to all applicable manufacturer's recommendations pertaining to jointing pipe.
- 5. For mechanical joints the plain end shall be centered and pushed into the bell and the gasket shall be firmly pressed evenly into the bell. The gland shall be slid to the bell for bolting. All bolts with oiled threads shall be alternately torque tightened 180

degrees opposite to each other to seat the gasket evenly. The maximum torque shall be as follows:

Bolt Size (inches)	<u>Applied Torque</u> (ft-lbs)	
5/8	50	
3/4	80	
1	90	
1 1/4	150	

All bolts and nuts shall be heavily coated with an approved bituminous or epoxy coating.

# 6. Solder Joints:

- a. No soldering of water main joints will be allowed on this project.
- b. Replace any existing soldered joints that are required to be connected to with a duo sleeve and retainer glands.
- 7. Use hexagon head nuts and bolts on all flanged joints. Bolts shall neither project more than 1/4-inch from, nor fall short of the end of the nut.
- 8. Use ring gaskets unless otherwise specified or approved by Engineer. Maximum gasket thickness shall not exceed 1/8 inch. Gaskets shall be suitable for service intended in accordance with manufacturers ratings and instructions.
- 9. Clean and lubricate bolt threads and gasket faces for flanged joints.

### E. Concrete Trust Blocks:

- 1. Provide concrete trust blocks as shown, required, or otherwise approved by Engineer.
- F. Transitions from One Type of Pipe to Another:
  - 1. Provide all necessary adapters, specials and connection pieces required when connecting different types and sizes of pipe or connecting pipe made by different manufacturers.

## G. Closures:

- 1. Provide all closure pieces shown or required to complete the Work.
- 2. Locate closures in straight runs of pipe.

# H. Backfilling:

- Conform to applicable requirements of Section 02200
   Earthwork.
- 2. Backfill by hand until pipe is covered by at least 1 foot of fill.

## 3.2 WORK AFFECTING EXISTING PIPING

- A. Location of Existing Piping:
  - 1. Locations of existing piping shown shall be considered approximate.
  - 2. Contractor is responsible for determining exact location of existing piping to which they must make connections, or which they may disturb during earth moving operations, or which may be affected by their work in any way.

# B. Work on Existing Pipelines:

- 1. Do not take pipelines out of service except where specified or approved by Engineer.
- 2. Cut or tap pipes as shown or required with machines specifically designed for this work.
- Install temporary plugs to keep out all mud, dirt, water and debris.
- 4. Provide all necessary adapters, fittings, pipe and appurtenances required.
- 5. Refer to Section 02200, Earthwork for additional requirements.
- 6. The Contractor shall provide a temporary thrust restraint system for existing pipes wherever the installation of new pipes disturbs the existing

pipe's thrust restraint. Upon completion of new pipe installation, the Contractor shall restore the existing pipe thrust restraint system to its condition at the onset of the job.

#### 3.3 TESTING OF PIPING

#### A. General:

- 1. Test all piping as specified below except as otherwise authorized by Engineer.
- 2. Notify Engineer 48 hours in advance of testing
- 3. Provide all testing apparatus, including pumps, hoses, gauges, and fittings.
- 4. Unless otherwise noted, pipelines shall hold the specified test pressure for a period of 2 hours.
- 5. Pipelines which fail to hold specified test pressure or which exceed the allowable leakage rate shall be replaced and retested.
- 6. Test pressures required are at the lowest elevation of the pipeline section being tested unless otherwise specified.
- 7. All gas piping shall be tested in accordance with NFPA 54.
- 8. Unless otherwise approved, conduct all tests in the presence of the Engineer.
- 9. All pipe shall be tested between valves.

# B. Schedule of Pipeline Tests:

- 1. For pressure test values see "Buried Piping Schedule."
- 2. Piping not on the schedule shall be tested at 1.5 times the maximum working pressure or 150 psi, whichever is greater.

- C. Pressure Test Procedure (Except for Fuel Oil Piping and Gravity Sewer Pipe):
  - 1. Backfill and compaction shall be completed at least to the pipe centerline before testing, unless otherwise required or approved by Engineer. Backfill and compact around all blocking before testing and as required to assure restraint by harnessed joints.
  - 2. Allow concrete for blocking to reach design strength before testing.
  - 3. Fill section to be tested slowly with water and expel all air. Install corporation cocks, if necessary, to remove all air.
  - 4. Test only one section of pipe at a time.
  - 5. Maintain the test pressure for at least 2 hours.
  - 6. Allowable Leakage Rates (in gallons per hour per 1,000 feet per inch diameter) except as otherwise noted:
    - a. Buried Ductile iron and PVC as specified in Table 4A AWWA C600, latest edition.
    - b. Exposed Ductile iron and PVC and pipe in tunnels: No leakage.
    - c. Copper, steel and Thermoplastic: No leakage.
    - d. Sodium hypochlorite and caustic Solution: No leakage.
  - 7. All visible leaks shall be made tight regardless of the amount of leakage or results of the leakage tests. If the pipes tested do not meet the leakage requirements of the leakage tests, they shall be replaced and retested as necessary until the leakage requirement is met.
  - 8. All Work found defective shall be replaced at the expense of the Contractor.

- D. Test Procedure for Gravity Sewer Piping:
  - 1. Backfill and compaction shall be completed at least to the pipe centerline before testing, unless otherwise required or approved by the Engineer.
  - 2. After pipe trenches have been satisfactorily backfilled to the required depth, piping shall be checked by the Engineer to determine if any displacement of pipe has occurred. A bright light shall be flashed between manholes. If the illuminated interior of the pipe shows displaced pipe, improper alignment or any other defects, the defect shall be corrected as determined by the Engineer. Upon satisfactory completion of the displacement test, the pipe shall be tested for leakage.
  - 3. The Contractor shall test each section of gravity sewer pipe between manholes for watertightness individually. No continuous sections shall be tested simultaneously.
  - 4. The Contractor shall plug the downstream end of the pipeline under test and all outlets discharging into the upstream manhole.
  - 5. The upstream manhole and the section of pipeline under test shall be filled by the Contractor with water. The elevations to which the manholes shall be filled is a minimum of 2 feet above the crown of the pipe, or at least 2 feet above existing groundwater, whichever is higher.
  - 6. The pipe shall remain filled for an initial 1 hour period to allow for stabilization. Following the stabilization period, water shall be added to the required elevation.
  - 7. Leakage loss shall be measured over a period of 4 hours. After the stabilization period, the Engineer will take 3 readings of the water level in the manhole, and 4 hours later, take 3 more readings. An average of the readings will be used by the Engineer to calculate leakage.

- 8. If the measured rate of leakage is less than or equal to the allowable leakage rate, the section of pipeline tested is acceptable. If the test fails, the section of pipe must be replaced at the expense of the Contractor, and retested by the same procedures. Regardless of the results of the leakage test, all visible leaks shall be repaired.
- 9. The maximum allowable leakage rate for any section of pipeline under testing shall not exceed 200 gallons per inch of internal diameter per mile of pipe per day.
- 10. At the conclusion of the test, clean all pipelines by flushing with water or other means, and remove any debris which may have entered the pipeline during construction.

#### 3.4 CLEANING AND DISINFECTION

A. Pipe cleaning and disinfection shall be in accordance with the requirements of Section 18175.



### SECTION 18052

### EXPOSED PIPING INSTALLATION

#### PART 1 - GENERAL

## 1.1 SUMMARY

## A. Scope:

- 1. The Contractor shall furnish all labor, materials, equipment and incidentals as shown on the Contract Drawings, specified and required to furnish and install and test all exposed piping, fittings, specials, and appurtenances. The Work includes, but is not limited to the following:
  - a. All types and sizes of exposed piping, except as specified under other Sections. These include, but are not limited to ductile iron, carbon steel, stainless steel, thermoplastic and copper.
  - b. Piping embedded in concrete within a structure or foundation will be considered as exposed and included herein.
  - c. Supports, restraints, and thrust blocks.
  - d. Testing.
  - e. Cleaning and disinfecting.
  - f. Installation of all joints, specials, couplings, flexible couplings, flanged adapters, expansion joints, sleeves, tie rods, jointing and gasketing materials and all other Work required to complete installation of exposed piping.
  - g. All valves, specials, sleeves, wall pipes and floor pipes shown or specified shall be incorporated into the piping system as required and as specified in the appropriate sections of Division 18.

2. Piping less than 4-inches in diameter is specified in Section 18068, but shall conform to applicable requirements of Section 18052.

### B. Coordination:

- 1. Review installation procedures under other Sections and coordinate with the Work which is related to this Section, including concrete, valves, electric, and ventilation.
- 2. Section 18052 specifies the installation of all exposed piping materials specified in Division 18. Coordinate with these Sections.
- C. Related Work Specified Elsewhere:
  - 1. Section 03300, Cast-In-Place Concrete.
  - 2. Section 09900, Painting. (Surface preparation and priming are under specific piping sections.)
  - 3. Division 18, Sections on Piping, Valves and Appurtenances.
  - 4. All piping specifically included with equipment.

## 1.2 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
  - 1. Comply with applicable requirements of UL and other authorities having jurisdiction.
- B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:
  - 1. ASME B16.3, Malleable Iron Threaded Fittings.
  - 2. ASMR B16.4, Gray Iron Threaded Fittings.
  - 3. ASME B16.5, Pipe Flanges and Flanged Fittings NPS 1/2 through 24.
  - 4. ASME B16.9, Factory-Made Wrought Buttwelding Fittings.

- 5. ASME B16.11, Forged Fittings, Socket-Welding and Threaded.
- 6. ASME B31.1, Power Piping.
- 7. ASME B31.8, Gas Transmission and Distribution Piping Systems.
- 8. AWS D1.1, Structural Welding Code.
- 9. AWWA C111 (ANSI A21.11), Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- 10. AWWA C206, Field Welding of Steel Water Pipe.
- 11. AWWA C600, Installation of Ductile-Iron Mains and Their Appurtenances.
- 12. AWWA C651, Disinfecting Water Mains.
- 13. AWWA M23, PVC Pipe Design and Installation.
- 14. NFPA 54, National Fuel Gas Code.

## 1.3 SUBMITTALS

- A. Shop Drawings: Submit for approval Shop Drawings showing the following:
  - 1. Catalog Data consisting of specifications, illustrations and a parts schedule that identifies the materials to be used for the various piping components and accessories. The illustrations shall be of sufficient detail to serve as a guide for assembly and disassembly.
  - 2. Complete layout and installation drawings with clearly marked dimensions. Piece numbers which are coordinated with the tabulated pipe layout schedule shall be clearly marked. Piping layout drawings shall indicate the following information on pipe supports: location, support type, hanger rod size, insert type and the load in pounds.
  - 3. Weight of all component parts.
  - 4. Design calculations where specified.

- 5. Tabulated pipe layout schedule shall include the following information for all pipe and fittings: service, pipe size, working pressure, wall thickness, piece number and laying length.
- 6. Interfacing of piping system to equipment and appurtenances.
- Full details of piping, fittings, specials and connections to equipment in plan and section.
- B. Tests: Submit description of proposed testing methods, procedures and apparatus. Submit copies of all test reports.
- C. Certificates: Submit certificates of compliance with referenced standards.
- D. Record Drawings: Submit in accordance with the requirements of Section 01720, Project Record Documents.

## 1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Handle all pipe, fittings and accessories carefully with approved handling devices. Do not drop or roll pipe off trucks. Do not otherwise drop, roll or skid pipe. Materials that are cracked, chipped, gouged, dented or otherwise damaged will not be approved.
- B. Store pipe and fittings on heavy wood blocking or platforms so they are not in contact with the ground.
- C. Pipe, fittings and specials shall be unloaded as close to the place where they are to be laid as is practical, at a location which has been approved by the Engineer. Interiors shall be kept completely free from dirt and foreign matter.
- D. No material furnished under this specification shall be shipped to the job site until all submittals have been approved.

# PART 2 - PRODUCTS

## 2.1 MATERIALS

A. Pipe materials required are listed in the Piping Schedules at the end of this section. The applicable Sections of Division 18 for detailed material Specifications apply.

## B. Pipe Marking:

- Class designation shall be cast or factory painted on each piece of pipe and fitting 3 inches in size and larger.
- 2. Each piece of pipe and fitting shall be clearly marked with a designation which shall conform with designations shown on the Shop Drawings.
- C. Pipe Identification Markers and Arrows: Refer to Section 09900, Painting.

### 2.2 EXPOSED PIPING SCHEDULE

A. Attached to the end of this Division is the "Exposed Piping Schedule." Conform to the requirements of the schedule, unless otherwise specified or approved by Engineer.

## PART 3 - EXECUTION

#### 3.1 INSTALLATION

### A. General:

- 1. Install piping as shown on the Contract Drawings, specified and as recommended by the manufacturer.
- 2. All pipes shall be sloped to avoid high spots and low spots and to facilitate drainage.
- 3. Request instructions from Engineer before proceeding if there is a conflict between the manufacturer's recommendations and the Contract Drawings or Specifications.

- 4. Pipe, fittings and accessories that are cracked, damaged or in poor condition or with damaged linings will be rejected.
- 5. For specially fabricated piping Contractor shall provide the services of a competent manufacturer's installation specialist when pipe installation begins, unless otherwise approved by Engineer.
- 6. Conflicts between piping systems and equipment or structures shall be presented to Engineer for determination of corrective measures before proceeding.
- 7. Install a flange or union at all equipment connections and valves.

## B. Piping:

- 1. Install straight runs true to line and elevation.
- 2. Install vertical pipe truly plumb in all directions.
- 3. Install piping parallel or perpendicular to building walls. Piping at angles and 45 degree runs across corners will not be accepted unless specifically shown or approved.
- 4. Install small diameter piping generally as shown when specific locations and elevations are not indicated. Locate such piping as required to avoid ducts, equipment, beams, etc.
- 5. Install piping so as to leave all corridors, walkways, work areas, and like spaces unobstructed. Unless otherwise approved provide a minimum headroom clearance under all piping of 6 feet 6 inches.
- 6. Provide temporary caps or plugs over all pipe openings at the end of each days work and when otherwise required or directed by Engineer.
- 7. Cutting: Cut pipe from measurements taken at site, not from Drawings.
- 8. Provide flanges for connection to pumps, valves and other flanged equipment.

#### C. Joints:

#### 1. General:

- a. Make joints in accordance with Piping Schedule and the pipe manufacturer's recommendations and the requirements below.
- b. Cut piping accurately and squarely and install without forcing or springing.
- c. Ream out all pipes and tubing to full inside diameter after cutting. Remove all sharp edges on end cuts.
- d. Remove all cuttings and foreign matter from the inside of pipes and tubing before installation. Thoroughly clean all pipe, fittings, valves, specials, and accessories before installing. Bell and spigot mating surfaces shall be thoroughly wire brushed and wiped clean and dry immediately before pipe is installed.
- 2. Threaded Joints: Use standard, right-hand tapered full depth threads on steel piping and apply an approved joint compound to the male threads only, before installation. Leave not more than three pipe threads exposed at each connection.

## 3. Solder Joints:

- a. No soldering of water main joints will be allowed on this project.
- b. Replace any existing soldered joints that are required to be connected to with a duo sleeve and retainer glands.
- 4. Flanged Joints: Assemble flanged joints with approved full-face gaskets and gasket compounds and draw up flange bolts evenly.
- 5. Plastic Pipe Joints: Make joints in plastic piping in accordance with the manufacturer's recommendations.

6. Use hexagon head nuts and bolts on all flanged joints. Use 1/8 inch thick full face gaskets unless otherwise approved by Engineer. Gaskets shall be suitable for service intended in accordance with manufacturer's ratings and instructions.

### D. Unions:

- 1. Install dielectric unions wherever dissimilar metals are connected except for bronze or brass valves in ferrous piping.
- 2. Provide a union downstream of each valve with screwed connections.
- 3. Provide screwed, flanged unions or flanged adapters at each piece of equipment, where shown, and where necessary to install or dismantle piping.
- E. Eccentric Reducers: Use eccentric reducers where shown and where air or water pockets would otherwise occur in mains because of a reduction in pipe size.

### F. Valves and Accessories:

- 1. Provide supports for large valves, and other heavy items.
- Position valve operators as shown. When the position is not shown, install the valve so that it can be conveniently operated and as approved by Engineer. Avoid placing operators at angles to the floors or walls.

## G. Wall Sleeves:

- Provide sleeves wherever pipes pass through walls, partitions, floors and roofs unless otherwise shown. Sleeves through wall shall be flush with wall face. Sleeves shall be as specified in Section 18096.
- 2. Anchor sleeves to concrete walls and structural steel as shown or otherwise approved.
- 3. All pipe joints and annular spaces in exterior walls or walls subjected to hydrostatic pressure shall be completely watertight.

- 4. Do not install sleeves and pipes through structural members unless specifically shown and approved by Engineer.
- H. Transitions from One Type of Pipe to Another: Provide all necessary adapters, specials and connection pieces required when connecting different types and sizes of pipe or connecting pipe made by different manufacturers.
- I. Additional Requirements for Copper Tubing:
  - 1. Joints shall be made with clean bright ends, properly fluxed, using 95 percent tin, 5 percent antimony solder. Solder containing lead will not be allowed.
  - 2. Runs shall contain unions at connections to equipment and at reasonable distances along the lengths of runs to permit convenient disassembly of piping and removal of equipment.
  - 3. All horizontal lines shall be pitched to facilitate draining. Unless otherwise shown and/or specified, all pipe runs shall be tapped at low points and fitted with minimum 1/2" NPT plugs. Drain lines shall not have a pitch less than 1/8-inch per foot.
- J. Additional Requirements for Thermoplastic Piping:
  - 1. All valves shall be supported independently of the piping system.
  - 2. Wide band supports as recommended by manufacturer and approved by Engineer shall be used to minimize localized stresses. Inert plastic shields shall be placed where plastic piping makes contact with steel and/or concrete.
  - 3. Piping passing through walls shall be provided with a sleeve of wearing material to prevent abrasion damage to piping.
  - 4. When anchors are required at locations other than equipment they shall be placed at elbows, valve locations and at bends in pipe line.
  - 5. Spacing of supports shall be in accordance with the manufacturers published values at the maximum design

- operating temperature of the pipe, but in no case shall exceed 6 feet on center.
- 6. Use "U" clamps with wide band inert plastic circumferential contact. Avoid all pressure contact with piping.
- 7. On long runs of piping use guides to maintain alignment and reduce chance of elastic failure of pipe. Space guides as recommended by manufacturer.
- 8. Use expansion joints to take up pipe expansion. Provide anchors to restrain the expansion joint. Use of the expansion joints shall be kept to a minimum. Flexible connectors may be used to absorb thermal movement when approved by Engineer.
- 9. Do not install pipe when temperature is less than 60°F except as otherwise recommended by manufacturer and approved by Engineer.
- K. Restraints, Supports and Thrust Blocks:
  - 1. Install restrained joints as specified.
  - 2. Provide concrete thrust blocks as shown or otherwise approved by Engineer.

### 3.2 TESTING OF PRESSURE PIPING

### A. General:

- 1. Test all piping as specified below unless otherwise authorized by Engineer.
- 2. Notify Engineer 48 hours in advance of testing.
- 3. Provide all testing apparatus including pumps, hoses, gauges, and fittings.
- 4. Pipelines shall hold the specified test pressure for a period of two hours.
- 5. Pipelines which fail to hold specified test pressures or which exceed the allowable leakage rate shall be repaired and retested.

- 6. Test pressures required are at the lowest elevation of the pipeline section being tested, unless otherwise specified.
- 7. Unless otherwise approved, conduct all tests in the presence of the Engineer.

## B. Schedule of Pipeline Tests:

- 1. For pressure test values see "Exposed Piping Schedule" at the end of this Division.
- 2. Piping not in Schedule shall be tested at 1.5 times the maximum working pressure or 30 psi, whichever is greater.

## C. Hydrostatic Pressure and Leakage Test Procedure:

- 1. Ensure that all supports and restraint protection are securely in place.
- 2. Fill section to be tested slowly with water and expel all air. Install cocks, if necessary, to ensure removal of air.
- 3. Test only one section of pipe at a time.
- 4. Apply test pressure required for two hours and observe pressure gauge. Check carefully for leaks while test pressure is being maintained.
- 5. Thermoplastic piping shall be tested with water and after the test, the water shall be removed.
- 6. Allowable Leakage Rates. No leakage permitted on any exposed pipe and no leakage permitted on any sodium hypochlorite piping (buried or exposed).

# 3.3 CLEANING AND DISINFECTION

A. Pipe cleaning and disinfection shall be in accordance with the requirements of Section 18175.

#### 3.4 SURFACE PREPARATION AND PAINTING

A. Refer to specific pipe specifications for painting systems required.

B. Piping that is field prepared and painted shall conform to the requirements of Section 09900, Painting.

+ + END OF SECTION + +

### SECTION 18064

## THERMOPLASTIC PIPE, FITTINGS, VALVES AND SPECIALS

### PART 1 - GENERAL

## 1.1 SUMMARY

## A. Scope:

- 1. The Plumbing Contractor shall furnish all labor, materials, equipment and incidentals as shown on the Contract Drawings, specified and required to furnish and install and place in satisfactory service polyvinyl chloride (PVC) conveyance pipe, chlorinated polyvinyl chloride (PVC) conveyance pipe, fittings, valves, and specials necessary to complete the Work.
- 2. The extent of piping is shown on the Contract Drawings and in the schedules following Division 18.

## B. Coordination:

- 1. Review installation procedures under other Sections and Contracts and coordinate with the Work that is related to this Section.
- C. Related Work Specified Elsewhere:
  - 1. Division 18, Sections on Piping, Valves and Appurtenances.

### 1.2 QUALITY ASSURANCE

- A. Source Quality Control: Obtain each type of pipe and fittings from one manufacturer.
- B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
  - 1. ASTM D 1598, Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure.

- 2. ASTM D 1599, Test Method for Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing and Fittings.
- 3. ASTM D 1784, Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
- 4. ASTM D 1785, Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120.
- 5. ASTM D 2122, Determining Dimensions of Thermoplastic Pipe and Fittings.
- 6. ASTM D 2321, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.
- 7. ASTM D 2467, Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
- 8. ASTM D 2564, Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
- 9. ASTM D 2774, Underground Installation of Thermoplastic Pressure Piping.
- 10. ASTM D 2837, Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products.
- 11. ASTM D 3139, Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
- 12. ASTM F 438, Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.
- 13. ASTM F 441, Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.
- 14. ASTM F 477, Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- 15. ASTM F 493, Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.

- 16. ASTM F 1970, Special Engineered Fittings, Appurtenances or Valves for use in Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Systems.
- 17. AWWA C605, Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings.
- 18. AWWA C900, Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm).
- 19. NSF/ANSI 14, Plastics Piping System Components and Related Materials.
- 20. American National Standards Institute (ANSI).
- C. Shop Tests: Piping manufacturer shall maintain a continuous quality control program. All PVC materials used to manufacture pipe and fittings under this Section shall be tested for conformance to the requirements of ASTM D 1784. Contractor shall furnish the Engineer with certified test results.

## 1.3 SUBMITTALS

- A. Shop Drawings: Submit for approval the following:
  - 1. Detailed procedures to be used in jointing and installing piping system, including manufacturer's recommendations.
  - 2. Bill of materials indicating material composition of pipe, pressure rating, nominal size and its location on the piping installation drawings.
  - 3. Submit this data with shop drawings required under Section 18051 and 18052.
- B. Tests: Submit description of proposed testing methods, procedures and apparatus. Submit copies of all test reports.
- C. Certificates: Submit certificates of compliance with referenced standards.

### 1.4 PRODUCT DELIVERY, HANDLING AND STORAGE

- A. Refer to Sections 18051 and 18052.
- B. Storage: All Pipe materials shall be stored off the ground in an area approved by the engineer. Do not store pipe in sunlight.

### PART 2 - PRODUCTS

#### 2.1 IDENTIFICATION

- A. All pipeline materials shall be permanently marked with the following:
  - 1. Name of manufacturer.
  - 2. Date of manufacture.
  - 3. Operating design pressure at operating design temperature.
  - 4. Mark number to match Shop Drawings.
  - 5. Type of pipe and nominal size.
  - 6. Manufacturer's part number.

### 2.2 PVC/CPVC PRESSURE AND CONTAINMENT PIPE

### A. General:

- 1. Plastic pipe and fittings covered under this Section shall be suitable for a maximum pressure of 150 psi at a temperature of 120 deg. F and should be provided in straight unthreaded lengths of not greater than 20 feet with ends cut square.
- 2. All wetted parts of PVC/CPVC piping and accessories shall be compatible with treatment chemicals.
- 3. Unless otherwise shown or ordered by the Engineer, PVC/CPVC pipe used outside should be solvent welded. Likewise, pipe used inside shall utilized flanged connections.

4. Solvent welded joints for chemical piping shall be made using solvent cement that meets or exceeds ASTM F 493, compatible with PVC/CPVC pipe and fittings. Solvent cement shall be low VOC, heavy duty gray industrial solvent cement by Oatey, Model EP42 or approved equal.

## B. PVC Pipe:

- 1. Unless otherwise shown or specified all pipe shall be PVC, Type 1, Grade 1, Schedule 80, conforming to ASTM D 1785. Rerun or reclaimed materials will not be acceptable.
- 2. Fittings: Solvent welded fittings shall conform to ASTM D 2467 for socket type.

## C. CPVC Pipe:

- Unless otherwise shown or specified all pipe shall be CPVC, Schedule 80, conforming to ASTM F 441. Rerun or reclaimed materials will not be acceptable.
- 2. Fittings: Solvent welded fittings shall conform to ASTM F 438 for socket type.
- D. Provide suitable sleeve-type expansion joints in exposed piping to permit 1-inch minimum expansion per 50 feet of continuous pipe length.
- E. Workmanship: The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign inclusions, or other defects. The pipe shall be uniform in color, opacity, density, and other physical properties.
- F. Dimensions and Tolerances: Dimensions and tolerances shall be measured in accordance with ASTM D 2122. The eccentricity of the inside and outside circumferences of the pipe walls shall not exceed 12 percent. Where required, internal diameter of flange adapters shall be chamfered to provide adequate clearance for operation of adjacent butterfly valves.
- G. Sustained Pressure: The pipe shall not fail, balloon, burst, or weep as defined in ASTM D 1598.

- H. Burst Pressure: The minimum burst pressure shall be as given, when determined in accordance with ASTM D 1599.
- I. Piping and fittings shall have ultraviolet inhibitor pigment to resist ultraviolet deterioration.
  - 1. All valves shall be supported independently of the piping system.
  - 2. Wide band supports as recommended by manufacturer and approved by Engineer shall be used to minimize localized stresses.
  - 3. Use "U" clamps with wide band inert plastic circumferential contact. Avoid all pressure contact with piping.
  - 4. Spacing of supports shall be in accordance with the manufacturers published values at the maximum design operating temperature of the pipe unless otherwise specified, shown or approved by Engineer.
  - 5. On long runs of piping use guides to maintain alignment and reduce chance of elastic failure of pipe. Space guides as recommended by manufacturer.
  - 6. Piping passing through walls shall be provided with a sleeve of wearing material to prevent abrasion damage to piping.
  - 7. When anchors are required at locations other than equipment they shall be placed at elbows, valve locations and at bends in pipeline.
  - 8. Use expansion joints to take up pipe expansion. Provide anchors to restrain the expansion joint. Use of expansion joints shall be kept to a minimum. Flexible connectors may be used to absorb thermal movement when approved by Engineer.
  - 9. Do not install pipe when temperature is less than  $60\,^{\circ}\text{F}$  except as otherwise recommended by manufacturer and approved by Engineer.

### 2.3 PVC AWWA C900 PIPE

A. Products delivered under this specification shall meet the requirements of AWWA C900 for nominal pipe diameters 4 inches through 12 inches and with AWWA C905 for nominal pipe diameters 14 inches through 36 inches.

Pipe shall be made from unplasticized PVC compounds having a minimum cell classification of 12454 as defined in ASTM D 1784. The compound shall qualify for Hydrostatic Design Basis (HDB) of 4000 psi for water at  $73.4\,^{\circ}\text{F}$ , in accordance with the requirements of ASTM D 2837.

Nominal outside diameters and wall thicknesses of PVC pipe shall conform to the requirements of AWWA C900. Integral bell joint pipe shall be furnished in 4", 6", 8", 10" and 12" sizes, in Class 200 (DR14). Pipe shall be furnished in standard lengths of 20 feet.

Pipe shall incorporate a formed bell complete with a single rubber gasket conforming to ASTM F477. Joints shall be designed to meet the zero leakage test requirements of ASTM D 3139.

Pipe shall be homogeneous throughout and free from voids, cracks, inclusions and other defects, and shall be as uniform as commercially practicable in color, density and other physical characteristics.

Every pipe shall pass the AWWA C900 hydrostatic proof test requirements of 4 times the pressure class for 5 seconds.

Underground pipe shall be installed in accordance with AWWA C605.

Pipe shall be legibly and permanently marked in ink with the following minimum information

- 1. Nominal size (for example, 4")
- 2. PVC
- 3. Dimension Ratio (for example, DR14)
- 4. AWWA pressure class (for example, PC 200)

- 5. AWWA C900, latest edition
- 6. Manufacturer's name or trademark and production code
- 7. Seal (mark) of the testing agency verifying the suitability of the pipe material for potable water service
- B. Polyvinyl chloride fittings and couplings shall conform to the requirements of the PVC pipe for classification and size. Rubber gaskets for elastomeric joints shall conform to ASTM F477. Lubricant for the joints shall be furnished by the pipe manufacturer. The rubber gaskets shall be factory installed in the bell of the pipe, fittings and couplings. The plain end of the pipe shall be marked by the manufacturer to show the depth of penetration into the bell or coupling.
- C. Provisions shall be made at the ends of each individual pipe length to receive and make the joint, as required.
- D. Pipe shall be laid with bells up grade.
- E. In laying the pipe, it shall be carefully lowered into the trench. Just prior to lowering the pipes, the surfaces of the joint rings shall be wiped clean and the joint rings and rubber gasket shall be liberally lubricated with an approved type of vegetable oil soap. The spigot end, with the gasket placed in the groove, shall be entered into the bell of the pipe already laid, making sure that both pipes are properly aligned. The pipe shall then be forced "home." Before the joint is fully "home" the position of the gasket in the joint shall be determined by means of a suitable feeler gauge supplied by the pipe manufacturer. If the gasket is found not to be in the proper position, the pipes shall be separated and the damaged gasket replaced.
- F. Immediately after the pipe is brought to final position, it shall be thoroughly secured and properly bedded, and ample support shall be provided to prevent settlement or disturbances. If a laying box is employed in lieu of sheeting, care should be exercised to prevent disturbing the bedding and position of pipe when moving the box.

## G. Manufacturer:

- 1. CertainTeed Corp.
- 2. Or approved equal.

## 2.4 VALVES AND SPECIALS

### A. General:

- 1. Refer to Section 18068 and/or 18099 for general requirements.
- Transitions from PVC to poly-tubing shall be made with barbed fittings and stainless steel clamps, or approved equal.
- 3. All wetted parts of PVC/CPVC valves and accessories shall be compatible with treatment chemicals.
- 4. Threads and dimensions: ASME B1.1 and B18.2.
- 5. Thread lubricant: Crane Solution 425 or approved equal.
- 6. Gaskets: Full face, 1/8-inch thick neoprene rubber.
- 7. Pressure connections to pressure switches, recorders, and indicating gauges shall be equipped with a snubber.

## B. Spring-Loaded Y-Check Valves:

- 1. Valves shall be true union, spring-loaded check type. Valve body shall be PVC and seals shall be EPDM.
- 2. Manufacturer:
  - a. Hayward
  - b. Or approved equal.
- C. Swing Check Ball Valves:

- 1. Valves shall be swing check ball valve combination type constructed from PVC Type I, ASTM D 1784 Cell Classification 12454.
- 2. All valves shall have Safe-T-Shear stem, Safe-T-Blocked Seal Carrier, and double stop polypropylene handle.
- 3. All valve components shall be replaceable.
- 4. All valves shall be maintenance free seal unit construction with EPDM seat and weighted disc.
- 5. All valves shall have external flow arrow direction designation.
- 6. All valves shall be pressure rated to 150 psi for water at 73 deg. F in full flow (open) position and to 75 psi at 73 deg. F back pressure (closed).

#### 7. Manufacturer:

- a. Hayward
- b. Spears Manufacturing Company
- c. Or approved equal.

#### D. Ball Valves:

- 1. Ball valves shall be Schedule 80, true union, 2000 Industrial type manufactured to ASTM F1970 and constructed from PVC Type I, ASTM D 1784 Cell Classification 12454 or CPVC Type IV, ASTM D 1784 Cell Classification 23447. Ball valves shall be vented.
- 2. Ball valves shall be manually or electrically actuated as indicated on the Drawings.
- 3. O-rings shall be EPDM or Viton.
- 4. All valves shall have Safe-T-Shear stem with double O-ring stem seals.
- 5. All valve handles shall be polypropylene with built-in lockout mechanism.

- 6. All valve union nuts shall have Buttress threads.
- 7. All seal carriers shall be Safe-T-Blocked.
- 8. All valve components shall be replaceable.
- 9. All valves shall be certified by NSF International for use in potable water service.
- 10. All 1/2-inch through 4-inch valves shall be pressure rated to 235 psi. All 6-inch and 8-inch venturied and all flanged valves shall be pressure rated to 150 psi for water at 73 deg. F.
- 11. Electric actuators, where called out on the drawings, shall be factory installed, 115VAC with thermally protected, reversing motor. Electric actuator shall be equipped with limit switch for the open and closed positions.

## 12. Manufacturer:

- a. Spears Manufacturing Company.
- b. Or approved equal.

## E. Y-Strainer:

- 1. Strainers shall be y-type and true union. Valve body shall be PVC or CPVC to match in-line piping.
- 2. O-ring shall be Viton.
- 3. Strainer shall have 40 mesh stainless steel screen.
- 4. Manufacturer:
  - a. Hayward.
  - b. Or approved equal.

## F. Anti-Siphon (Back Pressure) Valve:

1. Valve body shall be PVC or CPVC to match in-line piping.

- 2. Valve connections shall be NPT, except for valves 3-inches and larger which shall be flanged.
- 3. Diaphragms shall be PTFE, EPDM, or other material as required to be compatible with treatment chemical.
- 4. Valve top material shall be Noryl for 1/2-inch to 2-inches in size and PVC for 3-inches and 4-inches in size.
- 5. Manufacturer and Model:
  - a. Griffco G Series.
  - b. Or approved equal.

### G. Pressure Relief Valve:

- 1. Valve body shall be PVC or CPVC to match in-line piping.
- Valve connections shall be NPT, except for valves
   3-inches and larger which shall be flanged.
- 3. Diaphragms shall be PTFE, EPDM, or other material as required to be compatible with treatment chemical.
- 4. Valve top material shall be Noryl for 1/2-inch to 2-inches in size and PVC for 3-inches and 4-inches in size.
- 5. Manufacturer and Model:
  - a. Griffco G Series.
  - b. Or approved equal.

### H. Unions:

1. PVC/CPVC Unions for chemical service shall have Viton "O" Rings and shall be suitable for use with treatment chemicals.

### 2. Manufacturer:

- a. Hayward.
- b. Or approved equal.

## PART 3 - EXECUTION

### 3.1 INSPECTION

A. The Contractor shall inspect all piping to ensure that piping is free of defects in material and workmanship. The compatibility of all pipe, fittings and coating shall be verified.

### 3.2 INSTALLATION

- A. General: Refer to Sections 18051 and 18052 for piping installation, testing, cleaning and acceptance.
- B. Solvent welds: The chemicals used in solvent welding are intended to penetrate the surface of both pipe and fitting, which after curing, results in a complete fusion at the join. Properly used, the solvent effects a permanent and trouble-free weld. Familiarity with the products and techniques will result in a completely satisfactory installation. Use only PVC solvent with no thinner.
- C. All necessary precautions and safety procedures as outline by OSHA shall be strictly adhered to while using the solvent.
- D. Wipe off all dust, dirt and moisture from surface to be welded.
- E. With a non-synthetic bristle brush, in the following sequence, apply an even coating of solvent to the outside of the pipe. Then apply solvent to the inside of the fitting, and then re-apply a light coat of solvent to the outside of the pipe, making sure that coated area on the pipe is equal to the depth of the fitting socket.
- F. Insert pipe quickly into the fitting and turn the pipe a quarter turn (approximately) to ensure even distribution of the solvent and to eliminate air bubbles on surface bonded. Hold joint for 15 seconds so that

pipe does not push out from the fitting. Clean off any bead of excess solvent that appears at the outer shoulder of the fitting. Allow at least 15 minutes curing time for each welded joint before moving or handling.

- G. Check all fittings for correct position before solvent weld sets.
- H. Flanged connections: Flanged connections shall be installed as specified in Section 18051, 18052, and 18053 as applicable. Where flange type fittings are used, or other types of bolted connections such as expansion couplings, the use of a torque wrench is required, so that even tension is applied to all bolt and damage to the plastic components is prevented.

+ + END OF SECTION + +

### SECTION 18068

## SMALL DIAMETER PIPING, VALVES AND SPECIALS

#### PART 1 - GENERAL

#### 1.1 DESCRIPTION

## A. Scope:

- 1. Contractor shall furnish all labor, tools, materials, and equipment necessary for providing piping, valves and specials less than 4-inches in diameter, unless otherwise noted.
- 2. Included are all pipe, valves, fittings, couplings, specials, jointing materials, bolts, nuts and gaskets, factory-applied painting and other appurtenances required for the installation, testing and cleaning of above piping.
- 3. It is the intention of the Drawings and of these Specifications to provide complete and workable piping systems. Any miscellaneous fittings and appurtenances required for proper completion of the Work shall be considered as having been included under this Section.
- 4. Piping specifically excluded from this Section is as follows:
  - a. All piping, valves and specials 4-inches in diameter and larger.
  - b. All pipe specifically included with equipment.

### B. General:

- 1. All materials, equipment and appurtenances shall be new, clean and in accordance with material specifications. In no case will second-hand or damaged material be acceptable.
- 2. Piping shall be clearly marked by manufacturer as to material, type and rating.

- C. Related Work Specified Elsewhere:
  - 1. Section 09900, Painting (refer to specific piping specifications for surface preparation and shop priming).
  - 2. Division 18, Sections on Piping, Valves and Appurtenances.

### 1.2 QUALITY ASSURANCE

- A. Design Criteria: The design conditions are as described in this Section.
- B. Source Quality Control: All pipe and specials shall have the working pressure stenciled thereon. Pipe that has been designed for abnormal load conditions or thrust restraint shall have special markings thereon which can be readily identified.
- C. Reference Standards:
  - 1. Comply with applicable provisions and recommendations of the following:
    - a. AWWA C111 (ANSI A21.11), Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.
    - b. ASME B16.22, Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings DWV.
    - c. ASTM A 307, Carbon Steel Externally Threaded Standard Fasteners.
    - d. FS 0-F-506, Flux, Soldering; Paste and Liquid.

### 1.3 SUBMITTALS

- A. Shop Drawings: Submit for approval Shop Drawings showing the following:
  - 1. Illustrations, specifications and engineering data including: dimensions, materials, size, weight, coatings and linings for all piping, valves and appurtenances.

- Complete layout drawings including location of all valves, fittings, supports, and appurtenances. Type of joints, and restraints where provided, shall be clearly indicated.
- Interfacing of piping system to equipment and appurtenances.
- 4. Full details of piping, fittings, specials and connections to existing pipes or equipment in both plan and profile.
- 5. Detailed procedures to be used in jointing and installing piping system, including manufacturer's recommendations.
- 6. Bill of materials indicating material composition of pipe, pressure rating, nominal size and its location on the piping installation drawings.
- 7. Submit this data with Shop Drawings required under Sections 18051 and 18052.
- B. Tests: Submit description of proposed testing methods, procedures and apparatus. Submit copies of all test reports.
- C. Certificates: Submit certificates of compliance with referenced standards.

## 1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Refer to Sections 18051 and 18052.

#### PART 2 - PRODUCTS

### 2.1 COPPER TUBING

## A. Tubing:

- 1. Copper tubing shall be seamless tubing conforming to ASTM B 88.
- 2. Buried service tubing shall be Type K, soft.
- 3. Exposed copper tubing shall be Type L.

- B. Fittings: Fittings shall be wrought copper conforming to ASME B16.22, except fittings for instrument air shall be compression type, Swagelok, Mueller or approved equal.
- C. Joints: Joints shall be sweat type, with solder 95 percent tin, 5 percent antimony and flux conforming to FS 0-F-506, Type 1, except joints for instrument air shall be compression type, Swagelok, or equal.
- D. Surface Preparation and Field Painting: All exposed copper piping shall be field painted in accordance with Section 09900, Painting.

## 2.2 DUCTILE IRON PIPE

A. Conform to requirements of Section 18053.

### 2.3 CARBON STEEL PIPE

A. Conform to requirements of Sections 18053 and 18061.

#### 2.4 SPECIAL COUPLINGS

- A. Flexible Couplings:
  - 1. Conform to requirements of Section 18053 and 18055.
- B. Dielectric Pipe Couplings:
  - 1. Dielectric pipe couplings shall be used wherever copper pipe connects to steel, or ductile iron pipe and appurtenances. Couplings shall have steel bodies with nonconducting bushings on both ends. Ends shall have standard pipe threads. Couplings shall be rated for at least 200 psi at 225°F.

### 2. Manufacturer:

- a. ThermoDynamics Corporation.
- b. Watts
- c. Or approved equal.

## 2.5 VALVES AND SPECIALS

### A. General:

- All valves shall have manufacturer's name and working pressure cast in raised letters on valve body.
- 2. All manual valve operators shall turn clockwise to close unless otherwise specified. Valves shall indicate the direction of operation.
- 3. Unless otherwise specified all flanged valves shall have ends conforming to ASME B16.1, Class 125.
- 4. All buried valves shall be provided with adjustable two piece valve boxes and provided with extension stems, operating nuts and covers unless otherwise shown or specified. Extension stems shall terminate 12 inches below finished grade. All buried valves shall be of nonrising stem.
- 5. All bolts, nuts and studs on or required to connect buried valves shall be of stainless steel.
- 6. All bolts and studs embedded in concrete and studs required for wall pipe shall be of stainless steel.
- 7. All other bolts, nuts and studs shall conform to ASTM A 307, Grade B; or ASTM A 354.
- 8. Bolts and nuts shall have hexagon heads and nuts.
- 9. Gasket material and installation shall conform to manufacturer's recommendations.
- 10. Whenever bronze body valves are connected to plastic piping, the end connection shall be screwed with a solder adapter.

## B. Gate Valves:

- 1. For Exposed Piping:
  - a. Gate valves shall be resilient wedge type, iron body, bronze mounted. Gates shall open counterclockwise.

- b. The sealing surface of the cast iron wedge shall have the sealing surface of the wedge permanently bonded with resilient material to meet ASTM D429 tests for rubber to metal bond.
- c. Gate valves 3-inch diameter and larger shall have flanged end connections, valves less than 3 inches shall have screwed end connections unless otherwise specified.
- d. Valves shall have nonrising stem with operating nut and handwheel.
- Where indicated on the drawings, valves shall е. be furnished with a handwheel floor stand type valve operator for use on valves with nonrising stems. Extension stem shall be bronze with coupling, and the floor stand shall have integral indicator to show the valve position. The handwheel floor stand operator shall be model F-5500 as manufactured by Clow Valve Company, or approved equal. The handwheel operator shall be mounted to the grating assembly with stainless steel hardware and appropriate protection shall be provided to prevent dissimilar metal contact, applicable. Extension stem length shall be coordinated in the field by Contractor to suit the requirement application.

### f. Manufacturer:

- 1) Clow Valve Co.
- 2) Mueller Co.

## 2. For Buried Piping:

- a. Gate valves shall be double disc, iron body bronze mounted. Gates shall open counterclockwise.
- b. Buried gate valves shall have mechanical joint end connections and ductile iron retaining glands.

- c. Valves shall have nonrising stem with 2-inch operating nut.
- d. Each valve shall be provided with a valve box and cover. Valve box shall be two piece, cast iron with 5 1/2-inch shaft, screw type. Lid must fit securely in top section and "Water" shall be cast in lid.

### e. Manufacturer:

- 1) Clow Valve Co.
- 2) Mueller Co.

# 3. For Copper Piping:

- a. Gate valves shall be bronze body, with solid wedge disc and solder joints.
- b. Valves shall have a union bonnet and rising stem.
- c. Manufacturer:
  - 1) CVC Valves.
  - 2) Crane.
  - 3) Or approved equal.

## 4. For Carbon Steel Piping:

- a. Type: Outside stem and yoke, rising stem, split wedge.
- b. Body: Carbon steel, ASTM A 105.
- c. Stem and Split Wedge: Stainless steel.
- d. Ends: Flanged, ASME B16.5, Class 150.
- e. Manufacturer:
  - 1) Vogt Valves Inc.
  - 2) Powell Valves.

3) Or approved equal.

## C. Check Valves:

- 1. For Ductile Iron Piping:
  - a. Valves shall be swing check type of iron body, bronze mounted construction.
  - b. End connections shall be flanged or screwed.
  - c. Manufacturer:
    - 1) CVC Valves.
    - 2) Or approved equal.
- 2. For Copper Piping:
  - a. Check valves shall be swing check valves of bronze construction and solder joint ends.
  - b. Manufacturer:
    - 1) Crane.
    - 2) CVC Valves.
    - 3) Or approved equal.
- 3. For Other Services:
  - a. Type: Horizontal, swing.
  - b. Body: Carbon steel, ASTM A 216.
  - c. Internals: Stainless steel, ASTM A 74.
  - d. Manufacturer:
    - 1) Crane.
    - 2) Or approved equal.

## D. Ball Valves:

# 1. For Copper Piping:

- a. Ball valves shall be quarter turn, full port ball valve with a nonblowout stem and adjustable packing gland. Valve body shall be cast bronze and valve ball shall be chrome plated brass.
- b. Valve packing and seats shall be Teflon.
- c. Valve end connections shall be screwed. Provide a screw to sweat adapters where required.
- d. Manufacturer:
  - 1) Crane.
  - 2) Swagelok.
  - 3) Mueller.
  - 4) Or approved equal.

## 2. For All Other Uses:

- a. Type: Nonlubricated, full port.
- b. Body: Carbon steel.
- c. Ball and Stem: Stainless steel.
- d. Seats and Seals: Teflon.
- e. Ends: Flanged, ASME B16.5, Class 150.
- f. Manufacturer:
  - 1) Neles Corporation.
  - 2) Or approved equal.

#### E. Air Release Valve:

1. A 2-inch automatic air release valve shall be installed at each location shown on the Drawings

- and at locations where air binding of pipelines might occur.
- 2. Valve shall be 2-inch NPT screwed inlet and outlet with cast iron body and top, stainless steel trim and stainless steel ball float.
- 3. The valve shall satisfactorily withstand a hydrostatic pressure of 300 psi and operating pressure of 125 psi.

## 4. Manufacturer:

- a. Crispin, Model DL20
- b. Or approved equal.

## F. Gauges:

- 1. Pressure gauge shall be installed on suction and discharge connections to all pumps and where otherwise indicated.
- 2. Materials are as follows:
  - a. Case: Phenolic: dust proof
  - b. Diaphragm: Stainless Steel
  - c. Gauge Cock: Each Gauge: Brass Ball Valves
  - d. Miscellaneous Piping: Stainless Steel.
  - e. Snubber: Type 316 Stainless Steel.
  - f. Dial Size: 4 1/2 inches with a plastic case and white face with black markings. Window shall be acrylic with a micrometer adjustable black aluminum pointer.

## 3. End Connections:

- a. Diaphragm: 1" NPT x 1/4" NPT.
- b. Gauge Cock: 1" NPT x 1" NPT.
- 4. Range:

- a. Suction Compound:
  - 1) 0 to 30 inches of Hg.
  - 2) 0 to 30 feet of Water.
- b. Discharge
  - 1) Scale shall be as required for the application and as approved by the Engineer.
- 5. Accuracy:  $\pm 1/2\%$  of full scale.
- 6. Manufacturer:
  - a. Ashcroft Model 1279.
  - b. Marsh.
  - c. Or approved equal.

#### 2.6 MISCELLANEOUS

- A. Dry Taps in Pipe:
  - 1. Taps and connections to piping shall be made as required to connect equipment, gauges, valves, and where otherwise shown on the Drawings.
  - 2. Taps shall be Mueller "CC" pipe thread of the size indicated or required.
  - 3. Where pipe wall thickness is insufficient for the tap sizes shown, bosses or welding plates shall be added to the pipe or fitting, or an approved saddle may be used. Field welding will not be permitted.
  - 4. Threads shall be protected by a brass plug.

#### PART 3 - EXECUTION

# 3.1 INSPECTION

A. The Contractor shall inspect all piping to ensure that piping is free of defects in material and workmanship.

The compatibility of all pipe, fittings, and coatings shall be verified.

#### 3.2 INSTALLATION

A. Buried pipe shall be installed in accordance with the requirements of Section 18051. Exposed pipe shall be installed in accordance with the requirements of Section 18052. Valves shall be installed as specified in this Section.

#### 3.3 MISCELLANEOUS FITTING INSTALLATION

- A. Pipe in Wall or Floor Sleeves:
  - The annular space between all wall sleeves and carrier pipes shall be sealed with mechanical link-type seals.
- B. Transitions from one type of pipe to another shall conform with requirements of Sections 18051 and 18052.

#### 3.4 VALVE INSTALLATION

- A. Provide valves and specials in quantity, size, and type with all required accessories as shown on the Contract Drawings.
- B. Install all valves and appurtenances in accordance with manufacturer's instructions.
- C. Install suitable corporation stops at all points shown and required where air binding of pipe lines might occur.
- D. Install all valves so that operating handwheels or wrenches may be conveniently turned from operating floor but without interfering with access, and as approved by Engineer.
- E. Unless otherwise approved install all valves plumb and level. valves shall be installed free from distortion and strain caused by misaligned piping, equipment or other causes.
- F. Installation of all valves, specials and appurtenances shall conform to the requirements of Sections 18051 and 18052 where applicable.

G. Identification: Provide valve tags as specified under Section 09900.

#### 3.5 SPECIFIC PIPING INSTALLATION

## A. Copper Tubing:

- 1. Joints shall be made with clean bright ends, properly fluxed, using 95 percent tin, 5 percent antimony solder.
- 2. Runs shall contain unions at connections to equipment and at reasonable distances along the lengths of runs to permit convenient disassembly of piping and removal of equipment.
- 3. All horizontal lines shall be properly pitched to facilitate draining and all low points shall be provided with 3/4-inch hose bibbs properly located so that the entire system may be drained.

#### 3.6 FIELD TESTING

#### A. Leakage Tests:

- 1. Conform with requirements of Sections 18051 and 18052.
- 2. All auxiliary devices connected to the main process piping, such as pilot piping and gauges, shall be valved off or disconnected prior to the leakage testing. Upon completion of the tests, all connections shall be reestablished and the section of piping incorporating the auxiliary devices shall be retested at the required pressure.

#### 3.7 CLEANING

A. All piping shall be thoroughly cleaned and flushed as approved by the Engineer.

## 3.8 SURFACE PREPARATION AND PAINTING

A. All piping listed in the Schedule to be painted shall be prepared and painted in accordance with the requirements of Section 09900, Painting.

- B. All valves, except stainless steel and PVC, shall be prepared and field painted in accordance with Section 09900, Painting.
  - + + END OF SECTION + +

#### SECTION 18094

#### PIPE HANGERS AND SUPPORTS

#### PART 1 - GENERAL

#### 1.1 DESCRIPTION

#### A. Scope:

- 1. Plumbing Contractor shall furnish all labor, materials, equipment and incidentals as shown on the Contract Drawings, specified and required to provide an acceptable system of support, guidance and anchorage for all piping, valves, fittings, ductwork and specials.
- 2. Hangers and supports for Plumbing and Ventilation are specified herein.
- 3. All hangers, rods, bolts, nuts, inserts shall be Type 316 stainless steel. Concrete inserts shall be malleable iron with galvanized finish, fastened with aluminum nails.
- 4. Contractor shall provide all temporary pipe supports required during construction.

#### B. Coordination:

- 1. Review installation procedures under other Sections and coordinate the Work that must be installed with or attached to the hangers and supports.
- Contractor shall coordinate the location and placement of any necessary concrete inserts, and any cutting or drilling of structural members required.
- 3. Access Pathways, Facility Maintenance, Working Clearances and regular operations and maintenance activities shall be taken into consideration to the placement of pipe supports.

- C. Related Work Specified Elsewhere:
  - 1. Section 03300, Cast-In-Place Concrete.
  - 2. Section 05120, Structural Steel.
  - 3. Section 05500, Metal Fabrications.
  - 4. Section 09900, Painting.
  - 5. Division 18, Sections on Piping, Valves and Specials.

# 1.2 QUALITY ASSURANCE

- A. General: The Contractor shall conform to the following general criteria:
  - Materials and systems using stock or production parts shall be utilized unless otherwise shown or approved.
  - 2. Accurate weight balance calculations shall be made to determine the required supporting force at each hanger location and the pipe weight load at each equipment concentration.
  - 3. Pipe hangers shall be capable of supporting the pipe in all conditions of operation. They shall allow free expansion and contraction of the piping, and prevent excessive stress resulting from transferred weight being induced into the pipe or connected equipment.
  - 4. Hangers shall be installed so that they cannot become disengaged by movements of the supported pipe.
  - 5. Conform to the recommendations of MSS-SP-58 except where requirements of this Section 18094 are more stringent.
- B. Source Quality Control: Obtain each type of pipe hanger or support from no more than one manufacturer.
- C. Reference Standards: Comply with applicable provisions and recommendations of the following except as otherwise shown or specified:

- 1. The Manufacturers Standardization Society of the valve and Fittings Industry:
  - MSS SP-58, Pipe Hangers a. Supports - Materials, Design, Manufacture, Selection, Application, and Installation.
  - b. SP-69, Pipe Hangers and Supports -Selection and Application.
- 2. FS WW-H-171, Hangers and Supports, Pipe.
- 3. UL 203, Pipe Hanger Equipment for Fire Protection Service.
- 4. ASME B1.1, Unified Inch Screw Threads.
- 5. ASME B31, Codes for Pressure Piping.
- 6. ASTM A36, Carbon Structural Steel.
- 7. ASTM A47, Ferritic Malleable Iron Castings.
- 8. ASTM A276, Stainless Steel Bars and Shapes.
- 9. ASTM A307, Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
- ASTM A320, Alloy-Steel and Stainless Steel Bolting 10. for Low-Temperature Service.
- 11. ASTM A575, Steel Bars, Carbon, Merchant Quality, M-Grades.
- ASTM A666, Annealed or Cold-Worked Austenitic Stainless Steel, Sheet, Strip, Plate and Flat Bar.
- 13. ASTM A668, Steel Forgings, Carbon and Alloy, for General Industrial Use.

#### 1.3 SUBMITTALS

Contractor shall submit the Shop Drawings for approval Α. of the Engineer. Submittals shall include, but not be limited to:

- 1. Name and qualifications of the support and hanger engineer.
- 2. Detailed Shop Drawings showing all hangers and supports for each piping system. Shop Drawings shall show location, installation, material, loads, forces, stresses and deflections of all hangers and supports. Reaction forces imparted to structures to which hangers and supports are attached shall be shown.
- 3. Manufacturer's catalogs and engineering data on all hangers and supports.
- 4. Load ratings.
- 5. Materials.
- 6. Installation details.
- 7. All drawings and specified or required design calculations, signed and sealed by a New York State registered professional engineer.
- B. Contractor shall provide detailed drawings of each pipe support. Each drawing shall contain enough information to verify the pipe support design and to allow the manufacture of the device. At a minimum, the Contractor shall submit:
  - 1. Scaled details of the device with dimensions.
  - 2. A table of applied forces and moments.
  - 3. A complete bill of materials.
  - 4. An isometric showing the applied forces and moments.
  - 5. Detailed connections to existing structure.
  - 6. Shop and field welds.
- C. Each submittal shall have the following:
  - 1. A unique identification number and revision level.
  - 2. Stamp of a New York State registered professional engineer experienced in pipe support design.

## 1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery of Materials: All materials shall be inspected for size, quality, and quantity against approved Shop Drawings.
- B. Storage of Materials: All materials shall be packaged, labeled, and stored in a covered dry location until time of installation.

# 1.5 DESIGN REQUIREMENTS

- A. Contractor shall provide hangers and supports of sufficient strength to maintain the pipelines and appurtenances in proper position and alignment under all operating conditions.
- B. Contractor shall retain the services of a New York State Licensed Professional Engineer to design the supports for all pipelines and appurtenances, for all weights, forces and applied pressures. In the design of hangers, supports and anchors, unless otherwise shown or specified, pipe pressures shall be the maximum test pressures specified for pipelines carrying gases and twice the maximum test pressures specified for pipelines carrying liquids. The pipe support designer shall have a minimum of 5 years' experience in the design of pipe supports and have completed at least 5 successful pipe support projects of equal complexity as the system specified.
  - 1. Pipe support design shall include load and movement calculations.
  - 2. The following loads shall be included in pipe support design and pipe stress analysis:
    - a. Gravity Force, including weight of pipeline and appurtenances, contents, insulation, etc.
    - b. Thermal Expansion Force developed by the restraint of free end displacement of the piping.

- C. hydrostatic Forces developed by internal pressure during operation of the piping system.
- Loading due to expansion joint reaction d. forces.
- Seismic forces, as required by the Building e. Code of New York State
- 3. Supports, guides and anchors for flexible couplings and expansion joints shall be in accordance with the coupling and joint manufacturer's specification and the standards of the Expansion Joints Manufacturers Association.
- 4. Wherever possible, pipe supports shall be designed using manufacturer's standard catalog products.
- 5. Hangers and Supports for piping systems subject to thermal expansion and contraction, or to similar movements imposed by other sources, shall be designed to provide flexibility, and pipe stress analysis shall be provided.
- 6. Where resonance with imposed vibration and/or shock occurs during operation, suitable dampeners, restraints, anchors, etc., shall be added to remove those effects.
- 7. Occasional load calculations and pipe stress analysis shall be provided where required by the Detailed Specifications, Building codes or Standards. Occasional loads include:
  - a. Seismic forces.
  - Pressure waves produced by sudden changes in b. fluid momentum, commonly referred to as water hammer.
  - Wind, snow or ice loads.
  - d. Safety valve thrust loads.
- 8. Stresses in hangers, rods and brackets shall be in accordance with MSS-SP-58.

- C. All hangers and supports shall conform to the applicable requirements of ASME B31.1, MSS SP-58, SP-59, SP-69 and SP-90, except as modified herein, and be of standard manufacture wherever possible, and best suited for the service required.
- D. Unless otherwise approved, all hangers, supports and concrete inserts shall be listed with Underwriters' Laboratory, Inc.

#### PART 2 - PRODUCTS

# 2.1 GENERAL REQUIREMENTS

- A. Unless otherwise noted or shown, Contractor shall retain the services of a New York State Licensed Professional Engineer to design all piping supports. The Contractor shall supply and install pipe supports for all piping systems.
- B. Pipe and appurtenances connected to equipment shall be supported in a manner to prevent any stress being imposed on the equipment. When manufacturers have indicated requirements that piping loads shall not be transmitted to their equipment, certification shall be submitted stating that requirements have been complied with.
- C. The hangers and supports shall meet with the following requirements:
  - 1. Standard and fabricated hangers and supports shall be furnished complete with necessary inserts, bolts, nuts, rods, washers, and other accessories.
  - 2. Run piping in groups and parallel to building walls where practicable. Provide minimum clearance of one inch between pipe and other work.
  - 3. Install hangers or supports at all locations where piping changes direction.
  - 4. All valves and valve operators shall be rigidly supported independently of the piping.
  - 5. All hangers and supports shall be capable of adjustment after placement of piping.

- 6. Types of hangers or supports shall be kept to a minimum.
- All suspended or supported ductile iron pipe and 7. cast-iron pipe shall have a hanger or support adjacent to each hub or flanged end.
- 8. Vertical piping shall be supported at each floor and between floors by stays or braces to prevent rattling and vibration.
- 9. Hanger rods shall be straight and vertical. Chain, wire, strap or perforated bar hangers shall not be used. Hangers shall not be suspended from piping.
- 10. Prevent contact between dissimilar metals by use of copper plated, rubber, vinyl coated, or stainless steel hangers or supports.
- 11. Uninsulated PVC piping shall be protected from local stress concentrations at each support point. Protection shall be provided by Type 316 stainless steel protection shields or other method approved by the Engineer. Where pipes are bottom supported 180 degrees, arc shields shall furnished. Where 360 degrees of support required, such as U bolts, protection shields shall be provided for the entire pipe circumference. Protection shields shall have an 18 gage minimum thickness, not be less than 12 inches in length and be securely fastened to pipe with stainless steel straps not less than 1/2-inch wide.
- All insulated pipe shall be furnished with a rigid foam insulating saddle at each pipe support location. Provide Type 316 stainless steel protection shields at each location. Weld shields to pipe hangers. Hangers and supports shall provide for expansion throughout the full operating temperature range.
- All ferrous pipes shall be supported by galvanized 13. steel pipe attachment.
- 14. All copper piping shall be supported by plastic coated or copper plated steel pipe attachments.

- 15. Plastic piping shall be supported by plastic coated steel pipe attachments.
- 16. All supports, straps and hardware in clearwells (if applicable) shall be Type 316 stainless steel.
- 17. Vertical struts and horizontal members shall be of a size suitable for the service intended and be compatible with frame inserts as specified in Section 05500, Metal Fabrications. Structural steel shall conform to the requirements of Section 05120.
- 18. Insulated pipes shall have a 300 series stainless steel insulation protection shield a minimum of 12 inches long.
- Hangers and supports shall provide for expansion 19. and contraction throughout the full operating temperature range.
- Any required pipe supports, for which the supports called for in this Section are not applicable, shall be fabricated or constructed from standard stainless steel shapes, concrete and anchor hardware, and shall be subject to the approval of Engineer.
- Where hanger or support spacing does not correspond with joist or rib spacing, structural channels shall be attached to joists or ribs, and the pipes suspended therefrom.
- All points of adjustment for pipe and duct hanger 22. rods shall be locked securely in place using double-nutting. Double-nutting means two nuts torqued directly against each other under each point of adjustment in addition to a third nut on top of the bracket. Damaging threads or tack welding as a method of locking adjustment is not permitted.
- 23. All threaded assemblies shall be double nutted or provided with pinned nuts. Alternately, tack welding of bolted assemblies may be acceptable unless provisions for vertical adjustment is required.

- 24. Except where otherwise shown or required, horizontally valves 6-inches and larger shall be supported on each side of the valve, by pipe hangers or supports.
- 25. At all flexible couplings, supports shall be placed on each side and as close to the coupling as possible. Supports shall be the guide type which prevent axial movement from resulting in pipe deflection and misalignment.
- 26. Supports, anchorage and guidance for grooved end pipe shall be in accordance with the applicable sections of these specifications and the recommendations of the manufacturer.

#### 2.2 HANGERS AND SUPPORTS

- A. Hangers for Pipe Sizes 1/2-inch to 1-1/2 inch: Carbon Steel, adjustable swivel, split ring.
- B. Hangers for Pipe Sizes 2-inch to 4-inch and Cold Pipe Sizes 6-inch and over: Carbon Steel, adjustable clevis.
- C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- D. Wall Support for Pipe Sizes to 3-inch: Cast iron hook.
- E. Wall Support for Pipe Sizes 4-inch and over: Welded steel bracket and wrought steel clamp; adjustable steel yoke and cast-iron roll for hot pipe sizes 6-inch and over.
- F. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- G. Shield for Insulated Piping 2-inch and smaller: 18 gauge galvanized steel shield over insulation in 180 degree segments, minimum 12-inch long at pipe support.
- H. Shield for Insulated Piping 2-1/2 inch and larger (Except Cold Water Piping): Pipe covering protective saddles.
- I. Shield for Cold Water Piping 2-1/2 inch and larger: Hard block non-conducting saddles in 90 degree segments, 12-

inch minimum length, block thickness same as insulation thickness.

- J. Cast Iron pipe shall be supported at every joint and at a maximum of 5 feet between supports.
- K. Components of hangers and supports shall conform to the following where applicable:

#### 1. Materials:

- a. Bolts: ASTM A 307, Grade A, unless otherwise specified below.
- b. Anchor and Expansions Bolts: Type 316 stainless steel, including nuts and washers.
- c. Forgings: ASTM A 668.
- d. Malleable Iron: ASTM A 47.
- e. Rods and Bars: ASTM A 575.
- f. Threads: Unified Screw Threads, Class 2A and 2B, ASME B1.1.
- g. Structural Steel: ASTM A 36.

#### 2. Finish:

- a. Steel Items: Galvanized unless otherwise specified or shown on the Drawings.
- b. Plastic coated steel where specified above.
- c. Stainless Steel Items: No finish is required.
- L. Pipe Attachments: The following types of pipe attachments are acceptable:
  - 1. Adjustable Steel Clevis: MSS SP-58, Type 1.
  - 2. Steel Double Bolt Pipe Clamp: MSS SP-58, Type 3.
  - 3. Steel Pipe Clamp: MSS SP-58, Type 4.
  - 4. Adjustable Swivel Pipe Ring: MSS SP-58, Type 16.
  - 5. Adjustable Steel Band Hanger: MSS SP-58, Type 7.

- 6. Riser Clamp: MSS SP-58, Type 8.
- 7. Light Duty Clevis Hanger: MSS SP-58, Type 1.
- 8. Long Clips: MSS SP-58, Type 26.
- 9. Pipe Saddle Support: MSS SP-58, Type 36.
- 10. Pipe Stanchion Saddle: MSS SP-58, Type 37.
- 11. Adjustable Pipe Saddle Support: MSS SP-58, Type 38.
- 12. Insulation Protection Saddle: MSS SP-58, Type 39.
- 13. Insulation Protection Shield: MSS SP-58, Type 40.
- 14. Adjustable Pipe Roll and Base: MSS SP-58, Type 46.
- 15. Adjustable Roller Hanger: MSS SP-58, Type 43.
- 16. Pipe Slide Assembly, MSS SP-58, Type 35:
  - a. Material: Carbon steel tee with stainless steel slide plate; carbon steel base with filled teflon pad.
  - b. Type: Suitable for field welding to steel pipe. Modify with clamps and U-bolts for use with ductile iron pipe.
  - c. Product and Manufacturer:
    - 1) Anvil EPS, Figure 257, Type 3.
    - 2) Or approved equal.
- M. Structural Attachments: The following types of structural attachments are acceptable:
  - 1. Welded Steel Bracket: MSS SP-58, Type 32.
  - 2. Side Beam Bracket: MSS SP-58, Type 34.
  - 3. Malleable Concrete Insert: MSS SP-58, Type 18.
  - 4. Center I-Beam Clamp with Eye Nut: MSS SP-58, Type 28.
  - 5. Side Beam Clamp: MSS SP-58, Type 25.

- N. Steel Hanger Rods: Threaded both ends, threaded one end, or continuous threaded (minimum size 3/8 inch diameter, see Part 3 Execution), as required.
- O. Hanger Rod Attachments: Use as required to complete assembly:
  - 1. Forged Steel Clevis: MSS SP-58, Type 14.
  - 2. Adjustable Turnbuckle: MSS SP-58, Type 15.
  - 3. Forged Steel Weldless Eye Nut: MSS SP-58, Type 17.
- P. Anchorage Items: All anchor or expansion bolts, nuts and washers for anchoring pipe hangers and supports shall be Type 316 stainless steel where stainless steel piping is installed and Type 304 stainless steel in all other locations. Concrete anchors shall be self drilling type.
- Q. All other hangers and supports shall be in accordance with MSS SP-58.
- R. Product and Manufacturer: Provide hangers and supports as manufactured by one of the following:
  - 1. B-Line.
  - 2. Miro Industries, Inc.
  - 3. Anvil EPS.
  - 4. ELCEN Metal Product Company.
  - 5. Or approved equal.

#### 2.3 ROOFTOP PIPING SUPPORTS

A. Roller bearing pipe support with PVC seat and self lubricating Teflon base, UL rated and ASTM tested. Pillow Block Pipe Stand by Miro Industries, Inc. or approved equal.

#### 2.4 EQUIPMENT CURBS

A. By equipment manufacturer, when available, or fabricate curbs of manufacturer approved design and material. All curbs shall be a minimum of 12 inch in height unless otherwise specified.

#### 2.5 SURFACE PREPARATION AND PAINTING

A. All pipe supports except stainless steel and plastic coated steel for all piping listed in the Schedule to be painted shall be prepared and painted in accordance with the requirements of Section 09900, Painting. All supports shall be painted the same color as the pipe.

## PART 3 - EXECUTION

#### 3.1 GENERAL

- A. Locate hangers, supports, and accessories to support piping, valves, and all concentrated loads.
- B. Locate hangers, supports, and accessories within maximum span lengths specified to support continuous pipeline runs unaffected by concentrated loadings.
- C. All in line devices shall be removable without the need for temporary supports for adjacent and connecting pipe.
- D. Locate hangers and supports to prevent vibration or swaying and to provide for expansion and contraction.
- E. Pipe attachments for insulated pipe shall be large enough to accommodate pipe, insulation and shield.
- F. Install items to be embedded before concrete placement.
- G. Fasten embedded items securely to prevent movement during concrete placement.
- H. Hanger and support units installations methods shall be in accordance with manufacturer's recommendations.
- I. Adjust hangers and supports and place grout for concrete supports to bring pipelines to specified elevations. Grout shall be as specified in Section 03300, Cast-In-Place Concrete.

#### 3.2 INSTALLATION

A. Supports and Hangers for Horizontal Pipes: Space supports and hangers for all piping no farther apart than shown below unless otherwise shown on the Drawings:

#### 1. Copper Tube:

- Pipes up to 2 inches: 6 feet-0 inch center to a. center.
- Pipes 2 1/2 inches and larger: 8 feet-0 inch b. center to center.
- 2. Steel, Ductile Iron and Stainless Steel Pipe:
  - Pipes up to 1 inch: 6 feet-0 inch center to a. center.
  - Pipes 1 1/4 inches to 6 inches: 8 feet-0 inch b. center to center.
  - Pipes 8 inches and larger: 10 feet-0 inch center to center.
  - In addition, ductile iron pipe shall have a d. minimum of two supports per length and shall have a hanger or support adjacent to each hub.
- 3. Plastic Pipe: Maximum support spacing for plastic pipe at ambient temperature shall be one-half the above values for steel pipe except that support spacing shall not exceed 4 foot-0 inches.
- 4. Cast Iron Pipe:
  - Two supports per length. a.
  - b. Additional supports shall be placed immediately adjacent to any change in piping direction, and on both sides of valves, expansion joints, and couplings.
  - Hanger Rods shall be sized for maximum pipe C. loads and according to the schedule herein for minimum rod diameters:

Nominal Pipe	Minimum Rod	
(inches)	<u>Diameter (inches)</u>	
1/2 through 2	3/8	
2-1/2 through 3	1/2	
4 through 5	5/8	
6	3/4	

Nominal Pipe	Minimum Rod	
(inches)	Diameter (inches)	
8 through 12	7/8	
14 through 18	1	
20 through 30	1-1/4	

d. Hangers and supports for pipe 3 inches in diameter and larger shall be adjustable.

#### В. Supports for Vertical Piping:

- Provide riser clamp placed under hub, fitting or coupling with approved solid bearing on steel sleeve.
- Where riser clamps are used with plastic piping 2. they shall be modified so as not to exert any compressive forces on the pipe.
- 3. Vertical piping shall be supported at each floor and between floors by stays or braces to prevent rattling and vibration.
- Vertical plastic piping riser clamps shall be PVC 4. coated.

#### С. Expansion Anchors:

- 1. Use to fasten all base supports to floors.
- Use at hangers and brackets to support piping 1 inch in diameter and smaller and only if the anchor is designed to carry 200 percent of the load.

#### D. Rooftop Piping Supports:

- 1. Support horizontal piping at intervals no less than 6-feet.
- Place a support within 12-inch of each horizontal 2. or vertical elbow.
- 3. Where several pipes can be installed in parallel and at same elevation, provide multiple supports.

## 3.3 SEISMIC RESTRAINT

- A. Seismic restraint shall conform to the requirements of section 1621 of the New York State Building Code and the drawings. Shop drawings for the restraining system shall be provided by the manufacturer and shall include seismic analysis certified by a professional engineer licensed by the State of New York and under the employment of the manufacturer of the restraining system. Seismic requirements are defined on the structural drawings.
- B. All pipe supports, hangers, equipment supports, etc. shall comply with the above.

#### 3.4 TESTING

- A. All pipe support and restraining systems shall be installed and secured prior to the testing or activation or the pipeline on which they are installed.
- B. All pipe support systems shall be tested for compliance with the Specifications. After installation, each pipe support system shall be tested in conjunction with the respective piping pressure tests. If any part of the pipe support system proves to be defective or inadequate, if shall be repaired or augmented under this Section to the satisfaction of the Engineer.

#### 3.5 ACCEPTANCE AND SERVICE

A. Acceptance: All pipe systems shall be brought up to operating pressures and temperatures. Systems shall be cycled to duplicate operating conditions. All malfunctions shall be corrected. Contractor shall furnish all labor and materials to readjust and correct faults with hangers and supports for the piping systems.

+ + END OF SECTION + +



## SECTION 18175

#### DISINFECTION

# PART 1 - GENERAL

#### 1.1 SUMMARY

A. Scope: The Contractor shall be responsible for the disinfection of all potable water lines with compliance to codes and regulations as specified herein.

# 1.2 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies: Building Codes: Comply with applicable requirements of all governing authorities and the following codes:
  - 1. New York State Uniform Fire Prevention and Building Code.
  - 2. Orange County Department of Health.
- B. Reference Standards: Comply with applicable provisions and recommendations of the following except as otherwise shown or specified:

1.	ANSI/AWWA B300	Hypochlorites
2.	ANSI/AWWA B301	Liquid Chlorine
3.	ANSI/AWWA C651	Standard for Disinfecting Water Mains (exception: tablet method of disinfection specified in Section 4.3 is not acceptable.)
4.	APHA/AWWA/WPCF	Standard Methods for the Examination of Water and Wastewater

C. Testing: Bacteriological tests as specified below shall be provided by the Contractor.

#### 1.3 SUBMITTALS

A. Submit a description of the forms of chlorine, dosages, and proposed methods of application to the Engineer for approval.

- B. The following shall be submitted in compliance with the shop drawing requirements of Section 01342:
  - 1. A testing schedule, including proposed plans for water conveyance, control, disinfection, and disposal shall be submitted in writing for approval a minimum of 14 days before testing is to start. The submittal shall include the methods to determine evaporation loss and the Contractor's plan for the release of water from structures after testing and disinfection has been completed.

#### PART 2 - PRODUCTS

#### 2.1 GENERAL

- A. Provide all necessary equipment and materials, including chemicals, to perform the disinfecting operations.
- B. Temporary valves, bulkheads, or other water control equipment and materials shall be as determined by the Contractor. No materials shall be used which would be injurious to the structure or its future function.
- C. Chlorine for disinfection shall be in the form of liquid chlorine, sodium hypochlorite solution, or calcium hypochlorite granules. The tablet method shall not be permitted.
- D. Liquid chlorine shall be in accordance with the requirements of ANSI/AWWA B301. Liquid chlorine shall be used only:
  - 1. In combination with appropriate gas flow chlorinators and ejectors.
  - 2. Under the direct supervision of an experienced technician.
  - 3. When appropriate safety practices are observed.
- E. Sodium hypochlorite and calcium hypochlorite shall be in accordance with the requirements of ANSI/AWWA B300.

#### PART 3 - EXECUTION

#### 3.1 DISINFECTION

- A. General: The method to be followed shall be that prescribed by the local authorities or, in accordance with the procedures recommended by AWWA C651, Section 4.4 or 4.5 except the tablet method of chlorination as described in Section 4.3 of AWWA C651 will not be permitted:
  - 1. Before application of chlorine, flush the piping system with potable water at a velocity of not less than 3.0 feet per second.
  - 2. After the applicable retention period, flush the system using potable water.
  - 3. Disposal of heavily chlorinated water shall be in strict accordance with all applicable regulations and is the sole responsibility of the Contractor. If there is any possibility that the chlorinated discharge will cause damage to the environment, a neutralizing chemical shall be applied to the water to be wasted to thoroughly neutralize the residual chlorine in accordance with ANSI/AWWA C655.
- B. Emergency Repair and Connections to Existing: For connections equal to or less than one pipe length from the end of a new main to the existing main, the new pipe, fittings and valve(s) shall be spray disinfected or swabbed with a minimum 1 percent solution of chlorine just before being installed, as described in Section 4.11 of AWWA C651. In this case, after flushing to scour the pipe and obtain three volumes of water turnover, service can be restored prior to testing.
- C. Testing: Perform bacteriological tests in accordance with AWWA C651 and current published requirements of the Nassau County Department of Health (NCDH). In general, this shall require two samples for bacteriological analysis collected from sections of new water main not exceeding 1,200 linear feet, the termination of newly installed pipe, and from each branch, taken at intervals of one of the two following options:

- 1. Take an initial set of samples and then resample again after a minimum of 24 hours.
- 2. Let the main sit for a minimum of 24 hours without any water use, then collect two samples a minimum of 15 minutes apart while the sampling taps are left running.
- D. A chlorine residual measurement shall be collected and recorded at the time of sample collection by the Contractor and represented in the laboratory analytical reports. Samples should be collected after chlorine residual is either absent or no higher than prevailing in the distribution system.
- E. If the test for coliform organisms is negative, then the Contractor, at the discretion of NCDH, shall conduct a third set of confirmatory samples.
- F. If the NCDH test for coliform organisms is negative, the water main may be placed into service upon approval from the Engineer and NCDH. If the testing shows the presence of coliform bacteria, the disinfection and testing process shall be repeated at the expense of the Contractor until two additional consecutive negative samples are obtained.
- G. The disinfection procedure shall be repeated at the Contractor's expense until satisfactory bacteriological sampling has been achieved.

+ + END OF SECTION + +

#### SECTION 18190

#### PIPE INSULATION

#### PART 1 - GENERAL

#### 1.1 DESCRIPTION

#### A. Scope:

- 1. Contractor shall furnish all labor, materials, equipment and incidentals required to provide insulation for piping systems as shown on the drawings and as specified herein, including, but not limited to:
  - a. Domestic Cold and Hot Water Piping
  - b. Tempered water
  - c. Heat traced piping, if applicable
  - d. Others as shown on the Drawings
- B. Coordination: Insulation shall not be installed until piping has been field tested and approved by the Engineer.
- C. Related Work Specified Elsewhere:
  - 1. Section 09900, Painting.
  - 2. Division 18, Plumbing.

# 1.2 QUALITY ASSURANCE

- A. Manufacturer's and Installer's Qualifications:
  Manufacturer and installer shall have at least 5 years
  experience in producing similar type materials and show
  evidence of at least 5 installations in satisfactory
  operation.
- B. Design Criteria: Insulation systems including covering, mastics, adhesives, sealers and facings shall have the following fire hazard classifications:
  - 1. Flame spread, 25 maximum.

- 2. Smoke developed, 50 maximum.
- C. Source Quality Control: Provide certified test data for the following tests and inspections:
  - 1. Flame spread.
  - 2. Smoke developed.
- D. Requirements of Regulatory Agencies:
  - 1. Permits: Contractor shall obtain and pay for all required permits, fees, inspections and approvals by authorities having jurisdiction.
  - 2. Building Codes: Comply with applicable requirements of all governing authorities and the following codes:
    - a. New York State Uniform Fire Prevention and Building Code.
    - b. New York State Energy Conservation Code.
  - 3. Underwriters' Laboratories, Incorporated. Fire hazard ratings to be verified by Underwriters' Laboratories, Inc. label or listing or a certified test report from an approved independent testing laboratory.
  - 4. National Fire Protection Association.
- E. Reference Standards: Comply with applicable provisions and recommendations of the following except as otherwise shown or specified:
  - 1. ASTM C 547, Mineral Fiber Insulation.
  - 2. ASTM C 553, Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
  - 3. ASTM C 592, Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type).

- 4. ASTM C 612, Mineral Fiber Block and Board Thermal Insulation.
- 5. ASTM E 84, Test Method for Surface Burning Characteristics of Building Materials.
- F. Field Measurements: Take field measurements where required prior to installation to ensure proper fitting of Work.

#### 1.3 SUBMITTALS

- A. Samples: Submit for approval samples of the following:
  - 1. Fiberglass insulation.
  - 2. Weatherproof insulation jacket and fitting covers.
  - 3. Vapor Barrier.
- B. Shop Drawings: Submit for approval Shop Drawings showing the following:
  - 1. Manufacturers' catalog literature, specifications, and illustrations with the following information:
    - a. Thermal properties.
    - b. Physical properties.
    - c. Fire hazard ratings.
    - d. Facing information.
    - e. Installation instructions.
    - f. Jointing recommendations for butt joints and longitudinal seam.
  - 2. Fabrication instructions for pipe fittings and valve insulation and coatings.

## 1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery of Material: Material shall be delivered to the job site in corrugated cartons.

# B. Storage of Material:

- 1. Store material in clean, dry area, out of the weather.
- 2. Material shall be tightly covered to protect against dirt, water, and mechanical or chemical damage.
- 3. Material shall remain in original cartons until time of installation.

#### 1.5 JOB CONDITIONS

#### A. Protection:

- 1. Insulating materials shall, at all times, be protected from moisture.
- 2. Material shall be stored on or near the job site and drawn from this protected area as used.
- 3. All material applied in one day shall have the vapor barrier applied the same day and any exposed ends shall be temporarily protected with a moisture barrier and sealed to the pipe or equipment.

#### PART 2 - PRODUCTS

#### 2.1 MATERIALS

#### A. Fiberglass Insulation:

- 1. Manufacturer: Provide one of the following:
  - a. Johns Manville Corporation.
  - b. Owens Corning, FIBERGLAS<sup>TM</sup> Pipe Insulation SSL 11® with ASJ Max.
  - c. Certain Teed, Certain-Teed 500 F snap-on ASJ-SSL.
  - d. Or approved equal.

- 2. Type: Heavy density sectional pipe insulation with vapor barrier and self-sealing lap.
- 3. Density: 6 pounds per cubic foot, minimum.
- 4. Fittings: Molded fiberglass.
- 5. Jointing Materials: Manufacturers recommended adhesives and tape.
- 6. Valve Insulation: Miter cut nesting size covering segments of same thickness as pipeline, for insulation of valves.
- B. Weatherproof Insulation Jacket:
  - 1. Manufacturer: Provide one of the following:
    - a. Johns Manville Corporation, Zeston 2000 PVC.
    - b. Or approved equal.
  - 2. Type: Smooth PVC.
  - 3. Thickness: 20 mil, minimum.
  - 4. Fastening: Solvent welded.
- C. Insulated Fitting Covers:
  - 1. Manufacturer: Provide one of the following:
    - a. Johns Manville Corporation, Zeston 2000 PVC.
    - b. Or approved equal.
  - Type: Factory fabricated PVC jacketing for elbows, tees, valves, flanges, end caps, beveled collar fitting covers, etc.
  - 3. Thickness: 20 mils.
  - 4. Reference: Conform to ASTM E84.

## PART 3 - EXECUTION

## 3.1 INSPECTION

A. Ensure that surfaces of all pipes, valves, and fittings are clean and dry before applying insulation.

#### 3.2 PREPARATION

A. Ensure that piping and equipment has been tested, painted, inspected and released for application of insulation.

#### 3.3 INSTALLATION

- A. Pipe insulation shall be continuous through walls and floor openings except where walls or floors are required to be firestopped or required to have a fire resisting rating or required to be gas tight.
- B. Install insulation so as to make surfaces smooth, even, and substantially flush with adjacent insulation.
- C. Follow manufacturer's application instructions for all materials used.
- D. Provide insulation protection shields for insulated piping supported by pipe hangers. The metal shall be 300 series stainless steel and a minimum of 12 inches long.
- E. Install and coat insulation in accordance with the manufacturer's recommendations.
- F. Insulation for buried pipe shall be wrapped in tape as recommended by the manufacturer. No weatherproof jacket is required.
- G. Exposed Insulation shall be painted "Safety Blue" and labelled accordingly.

## 3.4 FIELD QUALITY CONTROL

A. Insure that insulation is dry when installed, before and during application of any finish.

#### 3.5 SCHEDULE

A. Refer to Paragraphs 1.1.A. for piping to be insulated. See schedule below for minimum thickness of pipe and fittings insulation:

# Minimum Insulation Thickness (inches)

# Pipe Size

# 1) All piping:

1/2" thru 1"	1
1-1/4" thru 2"	1-1/2
4" and larger	2

+ + END OF SECTION + +



## **SECTION 18469**

#### PRESSURE AND LEAKAGE TESTING

#### PART 1 - GENERAL

## 1.1 GENERAL

- A. Under this Section, the Contractor shall furnish all labor, materials and equipment to perform pressure and leakage testing of pipelines as shown, specified and/or directed.
- B. All piping carrying liquid, air, or gas shall be tested for tightness after installation in the presence of the Owner or Engineer. All tools, materials, equipment, meters, gauges, water, bulkheads and labor required for making the tests shall be provided by the Contractor and included in the Bid submitted for the work.

## 1.2 RELATED DOCUMENTS

- A. Section 18051 Buried Piping Installation.
- B. Section 18052 Exposed Piping Installation.

#### 1.3 REFERENCES

- A. Testing shall be in accordance with the latest revisions of the following codes, standards, and specifications, except where more stringent requirements are specified herein
  - 1. American Water Works Association (AWWA)
  - 2. National Fire Protection Association (NFPA)

#### 1.4 SUBMITTALS

- A. Submittals shall be submitted in accordance with the provisions set forth in the Special Project Conditions, General Provisions, and General Specifications.
- B. Contractor shall submit a sequence for flushing, testing and disinfection in compliance with AWWA Standard C651, latest version, within ten (10) days of

Notice to Proceed. The sequence shall include sections of newly installed pipe to be tested to 150 psi, Form of Chlorine to be used, method of chlorination, location of injection, flushing locations, rates of flushing (2.5-3.5 ft/sec), and locations of drainage facilities, and how and where flushing water will be de-chlorinated, number and locations of bacteriological samples, method of sampling.

- C. For each test, a completed Tabulation Sheet (Attachment A) shall be submitted.
- D. Proof of testing as required by County, State, or Federal Agencies and this Section shall be submitted.

#### PART 2 - PRODUCTS

#### 2.1 WATER SUPPLY

- A. Water supplied for flushing and testing shall be clean, clear and from potable sources acceptable to the Owner and Engineer.
- B. All water necessary for flushing and testing shall be furnished and disposed of in accordance with the General Specifications.

#### PART 3 - EXECUTION

#### 3.1 GENERAL

- A. Before filling, testing, and disinfecting the installed water main, the line shall be flushed in conformance with AWWA C651 ensuring adequate flushing velocity for the appropriate amount of time. Note that water used for these operations must be approved by the Owner or Engineer. Advanced notice shall be provided to the Engineer and Owner prior to conducting the scheduled tests.
- B. When existing water mains are used to supply test water, they should be metered and be protected from backflow

- contamination by temporarily installing a double check valve assembly between the test and supply main.
- C. Lines shall be filled and flushed slowly with potable water while venting air.
- D. Hydrostatic pressure testing of all water mains shall be conducted in accordance with the applicable AWWA standards and with satisfactory results. Prior to conducting the test, the Contractor shall bleed the air from the line being tested. All equipment, switches, metering devices in or connected to pipelines and designed only to withstand normal operating pressures shall be protected for the duration of the test. Testing shall be between closed valves, and where there is a hydrant it shall be against a closed hydrant.

### 3.2 TEST REQUIREMENTS

- A. All pressure piping shall be tested in accordance with AWWA Standard C-600. The following procedure shall be used:
  - 1. All newly laid pipe or any valved section thereof, shall be subjected to a hydrostatic pressure 50 percent in excess of the working pressure at any point in the section being tested, but in no case less than 150 pounds per square inch for a period of two hours.
  - 2. The Contractor shall accomplish the required tests on the pipeline by individually testing each component section of the installed main. The maximum length of section permitted to be tested at any one time will be approximately 1,200 linear feet, and normally will be less.

### B. Test Pressure Restrictions

- 1. The test pressure shall not be less than 150 psi at the highest point along the test section.
- 2. The test pressures shall not exceed pipe or thrust restraint design pressures.
- 3. The test pressures shall be of at least 2-hour duration and not vary by more than +5 psi.

4. The test pressures shall not exceed twice the rated pressure of the valves when the pressure boundary of the test section includes closed gate valves.

# C. Leakage Test

- 1. All leakage tests shall be conducted concurrently with the pressure test.
- 2. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure throughout the duration of the test after the pipe has been filled with water to the test pressure.
- 3. The rate of leakage shall be determined at 15 minute intervals by means of volumetric measurement of makeup water added to maintain the test pressure. The test shall proceed until the rate of leakage has stabilized, or is decreasing below an allowable value, for at least three (3) consecutive 15-minute intervals. After this, the test pressure shall be maintained for at least another 15-minutes.
- 4. The rate of leakage shall not exceed 10.5 gallons per day, per mile of pipe, per inch of nominal pipe diameter based on a test pressure of 150 psi. To calculate allowable leakage in gallons per hour (gph) for other test pressures, refer to Table 6 of AWWA C600.
- 5. Upon completion of the test, the line pressure shall be released at a point farthest from the testing point.

### 3.3 FIELD MEASUREMENTS

- A. The length of the test section shall be measured.
- B. The quantity of water used to maintain test pressure during test period shall be measured.
- C. All measurements required to complete the Tabulation Sheet shall be measured and recorded.

# 3.4 COORDINATION

- A. 48-hour notice shall be provided to the Engineer and Owner when water for flushing and testing is required.
- B. The Owner of the existing water system shall operate all valves and hydrants unless Contractor has been authorized by said Owner to operate water systems, valves and hydrants.

### 3.5 PREPARATION

- A. The Contractor shall supply all plugs, pumps, weirs, gauges, etc., necessary to conduct the tests, including means to accurately measure the quantity of water used to maintain test pressure during the test period.
- B. All piping systems shall be flushed with water prior to testing.

### 3.6 TESTING

- A. Pressure and leakage tests shall be conducted on all pressure piping.
- B. The Owner or Engineer shall be notified of the test at least 48-hours in advance and shall witness all tests.
- C. All test results shall be recorded on the Tabulation Sheet (Attachment A).
- D. Each valved section of pipe shall be slowly filled with water. The specified test pressure, based on the elevation of the highest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe.
- E. Before applying the specified test pressure, air shall be expelled completely from the pipe and valves.
- F. Any exposed pipe, fittings, valves, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, or valves that are discovered following the pressure test shall be repaired or replaced with sound material as directed by the Engineer and the test shall be repeated.

- G. All visible leaks, regardless of the amount, shall be repaired.
- H. If the section being tested fails to pass the pressure or leakage test, the Contractor shall determine, at their own expense, the source or sources of leakage, and they shall permanently repair or replace all defective materials and/or workmanship. The extent and type of repair as well as results, shall be subject to the approval of the Engineer. The completed pipe installation shall then be retested and required to meet the pressure and leakage requirements of this test.
- I. Testing and retesting shall be completed prior to final paving.
- J. The use of sealants, applied from outside or inside of pipe, is not acceptable.

+ + END OF SECTION + +

(ATTACHMENT A FOLLOWS)

# ATTACHMENT A

# FLUSHING AND TESTING TABULATION SHEET

Job No Location _			
Contract No. Contrac	tor	_	
Project _			
Contractor's Representative _	Obser	eved by _	
FLUSHING			
Date Weather _		Temperatu	ire _
Section Flushed	ft.	inch di	iameter pipe
Line Flushed Line Flushed Through		min. @ Manhole # _	gal/min
PRESSURE AND LEAKAGE TESTING			
		Temperature	
Section Tested  Ft. of )_ inch diameter pip  Time started Time finished		f Elapsed	t. laying lengths time
Test Pressure: Start			psi
Water to Make up Initial Pressure		_	
Allowable leakage, as calculated Gallons (allowable leakag		_	_
Section Garrons (arrowable reakay	C IIOIII .		ICCIIIICCI IICVISIOII
Pass Fail			

 $L = \frac{SD\sqrt{P}}{144,800}$ 

L = Allowable leakage in gallons/hour
S = Length of pipe tested (linear feet)
D = Nominal diameter of pipe (inches)

P = Average pressure during test, psi

<sup>\*</sup>Refer to C600 for additional allowance leakage against closed metal-seated valves.

### SECTION 18483

### ELECTRIC HOT WATER HEATER

### PART 1 - GENERAL

# 1.1 GENERAL

A. General Provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

### 1.2 WORK DESCRIPTION

A. The Plumbing Contractor shall provide tanked-type hot water heater for providing domestic hot water, and all appurtenances (piping, trim, etc.) defined here-in, as shown and as scheduled on the drawings, and per the manufacturer's installation requirements.

### B. Codes

- 1. The following codes shall apply to the extent noted here-in.
  - a. Listing and Labeling: Provide electrically operated components specified in this section that are listed and labeled.
    - 1) The terms "listed" and "Labeled": As defined in NFPA 70, Article 100.
    - 2) Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.
  - b. Comply with NFPA 70 for electrical components and installation.
  - c. CSA/UL Design Certified
  - d. AHRI Energy Efficiency Certification

# 1.3 SUBMITTALS

A. Product Data: Provide manufacturer's submittal data for Engineer review and project records. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories for each model

indicated. Where data sheets include multiple models, options or ratings, clearly indicate all applicable data.

- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
  - 1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer installed and field installed wiring.
- C. Source Quality Control Tests and Inspection Reports: Indicate and interpret test results for compliance with performance requirements before shipping.
- D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- E. Maintenance Data: Include in the maintenance manuals specified in Division 1. Include parts list, maintenance quide, and wiring diagrams.

### 1.4 GUARANTEE

- A. General Guarantee: The special guarantee specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other guarantees made by the Contractor under requirements of the Contract Documents. Installing contractor shall provide two years of guarantee parts and labor.
- B. Special Guarantee: Submit a written guarantee, executed by the contractor.

Guarantee Period: From date of acceptance, manufacturer's standard warranty: 3 year limited warranty on storage tank, 1 year warranty for all other components.

### PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Available Manufacturers: Manufacturer shall be a company specializing in manufacturing the products

- specified in this section with minimum five (5) years experience. Specifications use A.O. Smith as the basis of design.
- B. Service Access: Units shall be provided with front access panels for easily accessing all serviceable components. All components must be accessible and able to adjust with the removal of a single cover or cabinet component.
- C. Water heater shall include a diagnostic control panel with a full text display. Access to the controls shall not require tools or removal of panels or covers.

### 2.2 COMPONENTS

- A. Storage Tank: Glass lined storage tank, ANSI rated for 150 psig working pressure.
- B. Electronic ignition system
- C. Jacket: Foam insulation enclosed by a steel outer cover with baked enamel finish.
- D. Drip pan: Field supplied and installed drip pan.
- E. Drain valve: Hose bibb drain valve.
- F. Safety Relief Valve: ASME rated, factory set to protect water heater and piping as per schedule/drawings.
- G. Adjustable thermostat up to 180 degrees.

### PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine area to receive heaters for compliance with requirements for installation tolerances and other conditions affecting water heater performance. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

A. Install units level and plumb, according to manufacturer's written instructions and referenced standards.

- B. Support water heaters on 12 inch thick concrete base, 4 inch larger on each side than base of unit. Use only manufacturer provided or recommended mounting hardware
- C. Install all ancillary devices furnished with units, but not specified to be factory mounted.
- D. Install a 3/4 inch drain valve on the outlet piping prior to the first shut off valve.

### 3.3 CONNECTIONS

- A. Connect water piping to inlet and outlet tappings with shutoff valve and union or flange at each connection.
- B. Install piping from safety relief valves to nearest floor drain.
- C. Electrical: Comply with applicable requirements in Electrical specifications.

# 3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory authorized service representative to supervise the field installation and assembly of components, including piping and electrical connections. Report results in writing.
  - 1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Manufacturer's representative shall supply a factory authorized service technician to start up and commission the units.

### 3.5 CLEANING

- A. Flush and clean units on completion of installation, according to manufacturer's written instructions.
- B. After completing installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, construction debris and repair damaged finishes including chips, scratches, and abrasions.

### 3.6 COMMISSIONING

A. Engage a factory authorized service representative to provide startup service. Start up to be performed only

- after complete installation is field verified. Two year guarantee shall be handled by factory authorized tech.
- B. Verify that installation is as indicated and specified.
  - 1. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements. Do not proceed with startup until wiring installation is acceptable to equipment Installer.
- C. Complete manufacturer's installation and startup checklist. Verify the following:
  - 1. Unit is plumb and level on concrete base and securely fastened per manufacturer's recommendations.
  - 2. No damage is visible to jacket, refractory, or internal components.
  - 3. All pipe fittings are secure, clean and free of leaks.
  - 4. Clearances have been provided and piping is flanged or installed with unions for easy removal and servicing.
  - 5. Pipe has been connected to correct ports.
  - 6. Labels are clearly visible.
  - 7. Units and surrounding area are clean and free of construction debris.
  - 8. Pressure and temperature gauges are installed.
  - 9. Control installations are completed.
- D. Check that fluid level, flow switch, and high temperature interlocks are in place, and that outlet temperature limits have been set.
- E. Perform the following tests, and measure and record the following:
  - 1. Inlet water temperature
  - 2. Outlet water temperature

3. Water flow rate

### 3.7 DEMONSTRATION

- A. Engage a factory authorized service representative to train Owner's maintenance personnel as specified below:
  - 1. Operate units including accessories and controls, to demonstrate compliance with requirements.
  - 2. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventative maintenance.
  - 3. Review date in the maintenance manuals.
  - 4. Schedule training with Owner with at least 7 days advance notice.
  - 5. A signed attendance sheet is required.
    - + + END OF SECTION + +

### SECTION 18600

### BACKFLOW PREVENTERS

### PART 1 - GENERAL

# 1.1 SUMMARY

- A. Related Documents:
  - 1. Drawings and general provisions of the contract apply to this Section.
  - 2. Review these documents for coordination with additional requirements and information that apply to work under this Section.
- B. Related Sections:
  - 1. Small Diameter Piping, Valves and Specials, Section 18068

### 1.2 SUBMITTALS

- A. General: Submit the following in accordance with Section 01342, Shop Drawings, Product Data and Samples:
  - 1. Product Data:
    - a. Manufacturer's specifications, installation instructions for each type of backflow preventer and test kit and other data required to demonstrate compliance with the specified requirements.
  - 2. shall be furnished Proof that each model/design and size of backflow preventor being furnished for the project is approved by and has a current "Certificate of Approval" from Foundation for Cross-Connection Control Hydraulic Research, University of Southern California (FCCCHR). Listing of particular make, model/design, and size in NAVFACINST 11330.11D or in the current FCCCHR List of Approved Backflow Prevention Assemblies will be acceptable as the required proof.

# 1.3 QUALITY ASSURANCE

### A. Standards:

- 1. Referenced Specifications: The State Department of Health Sanitary Code for Cross Connection Control, and other standards listed in Part 2 of this section.
- 2. Where conflicts occur between referenced standards, the most stringent requirements shall apply.
- 3. AWWA C511, Reduced-Pressure Principle Backflow Prevention Assembly
- 4. FCCCHR of USC Manual Section 10
- 5. IAPMO (Uniform Plumbing Code), ICC (International Plumbing Code)
- 6. ASSE 1015, Performance Requirements for Double Check Backflow Prevention Assemblies

### PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Watts, 815 Chestnut Street, North Andover, MA, 01845-6098, USA. Tel: 1-978-689-6066
- B. Or approved equal

# 2.2 REDUCED PRESSURE ZONE ASSEMBLY

- A. The assembly shall be Watts LF909.
  - 1. Main Valve Body: Lead free copper silicon alloy
  - 2. Relief Valve Body: Lead free copper silicon alloy
  - 3. Shutoff Valves: Integral ball valve
  - 4. Check Seats: 909 Celcon
  - 5. Spring: Stainless Steel
  - 6. Temperature Range: 33°F 140°F (0.5°C 60°C)
    Continuous

- B. The reduced pressure zone assembly shall be installed on the potable water supply at each point of crossconnection to protect against possible backpressure and backsiphonage conditions for high hazard applications.
- C. The assembly shall feature lead free construction to comply with low lead installation requirements.
- D. The assembly shall consist of a main line valve body composed of a pressure differential relief valve located in a zone between two (2) independently acting approved check modules with replaceable seats.
- E. Servicing of the pressure differential relief valve and both check modules shall not require any special tools; both check modules shall be accessible through independent covers.
- F. The assembly shall be fitted with two (2) AWWA compliant inlet/outlet resilient seated shutoff valves and contain four (4) properly located resilient seated test cocks as specified by AWWA C511.

### PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install the work of this section in accordance with the manufacturer's printed installation instructions.
- B. Installation of plumbing systems including fixtures, equipment, backflow prevention assemblies materials and workmanship shall be in accordance with the New York State Plumbing Code, except as modified herein.
- C. Once installed and prior to being placed into service all devices shall be tested in compliance with New York State Department of Health Regulations. The installation and testing of the backflow prevention device must be witnessed by the Engineer or the device and test results will be unacceptable. Replacement and/or retesting of the device shall be at no additional cost to the Owner. Results of the test shall be forwarded to the Engineer and the local health department.

- D. Contractor shall complete all applications and registrations to the water supplier and the New York State Department of Health as required.
- E. The Contractor shall support the backflow prevention device as required.

+ + END OF SECTION + +

# APPENDIX I

# SUBSURFACE INVESTIGATION REPORT



# KEVIN L. PATTON, P.E. 36 PATTON ROAD NEWBURGH, N.Y. 12550

845 275-7732 PATTONGEOTECH.COM

CLIENT:	Town of Blooming Grove	PROJECT:	Senior Center	l
	2741 Route 94		Lassen Park	l
	Blooming Grove, NY 10914	Project No.	21319	l
		Date:	October 2, 2021	l

### SUBSURFACE INVESTIGATION REPORT

# PROJECT DESCRIPTION

This geotechnical investigation report was prepared for use in the design and construction of a one-story building with full basement. The basement will be concrete and the first floor level of the building will consist of seven modular units assembled into a rectangular structure with nominal dimensions of 64x96 feet (6144 square feet.) The proposed building location is a grass field sloping gently to the east (compass northeast,) on the south side of the Lassen Park entrance drive and east of the parking lot. The existing elevations in the building area range from approximately 345 to 350 feet.

The USDA Soil Survey indicates that the native topsoil type in the project area is Mardin gravelly silt loam, which forms over deep deposits of dense glacial till, typically with a somewhat sandy to gravelly texture (gravelly silty sand, sand and gravel with little silty clay, etc.) The soils encountered in the test pits were generally consistent with the Soil Survey data, although the silt and clay content of the till in the second test pit was lower than normal. The local bedrock is thinly-layered gray siltstone and shale; it was not encountered in the test pits.

### SOIL INVESTIGATION AND TEST RESULTS

Two test pits were excavated on September 3, 2021, using a backhoe. Excavation was performed by the Town Highway Department. The subsurface investigation was supervised and witnessed by Kevin Patton, P.E., assisted by Warren Patton. Soils were observed and sampled, and field testing was performed using a Static Cone Penetrometer, to measure the bearing resistance of the soil.



PHOTO 1: View of the project area, facing southwest, with a pile of excavated soil next to Test Pit 1.

Field observations and test data are provided on the attached Test Pit Logs. Laboratory testing was performed on representative soil samples, for moisture content and particle size distribution. USCS classifications of the soil, per ASTM D2487 and D2488, are provided on the logs.



PHOTO 2: View of the northeast building corner, starting to excavate Test Pit 2. The entrance road crosses a small tributary to Moodna Creek about 200 feet east from end of the proposed building.

**Summary of Laboratory Data** 

Natural Moisture Content, Percent			
Depth, feet	TP1	TP2	
3	11.0		
5		10.6	
6	13.0		

	SOIL TEXTURE					
	Particle Size Analysis					
Loc	cation	TP1	TP2			
Dep	th6 feet	6 feet	5 feet			
LICC	S Class	SM, Silty Sand with	GW-GM, Well-graded			
030	.5 Class	Gravel	Gravel with Sand			
Sieve Size	mm	Percent Passing by Weight				
1½"	37.5	90	92			
3/4"	19.0	84	66			
#4	4.75	69 47				
#10	2.00	63 35				
#40	0.425	52 18				
#200	0.075	34	8.7			

# **Subsurface Profile and Summary of Soil Conditions**

The test pits indicate that native soil is present throughout the proposed building area. The soil is layered glacial till, composed of gravelly silty sand, sandy gravel with traces silt, and similar soil types. The surface

has been tilled and re-graded, but no prior development is believed to have occurred in the building location. There were no indications of shallow bedrock. Groundwater was encountered at about 5'6" below grade on the high end of the building area and at about 4'8" depth on the low end. At the time of the investigation the local soils were generally in a high-moisture condition, with higher-than-average seasonal rainfall and a major storm event (the remnants of Hurricane Ida) producing several inches of rain about two days prior to digging the test pits.

### **Subgrade Preparation**

The evaluation indicates that the soils throughout the proposed building area are suitable for the use of shallow spread footing foundations and slabs-on-grade, subject to performing the required subgrade preparation operations, as described below.

Remove all existing topsoil, soft subsoil and large roots from the subgrade surface, in all building areas. Use methods that minimize disturbance of the final subgrade surface. Compact the surface to consolidate any soil that was loosened during excavation. Remove any pockets or small zones of unsuitable materials that are encountered, and replace them with controlled compacted fill. Contact the Engineer prior to performing any significant extra excavation. Where stumps or boulders are removed, or where other over-excavation work is performed to prepare subgrade areas, the sides of the excavation shall be trimmed back to stable soil as each lift is placed; as the backfill is compacted, extra care shall be taken to insure thorough compaction where the edges of each lift meet the sides of the excavation. Where deficient soil is removed from below footing locations, the remediated area shall extend at least one foot out from the footing per foot of depth (1 to 1 splay.)

Footings may bear directly on the prepared subgrade, or on controlled compacted fill placed over the subgrade. Footing bearing surfaces shall be free from frost, mud and loose soil or standing water, when concrete is placed. Where fine-grained native soil is present at the bearing elevation, a layer up to four inches thick of Structural Fill may be placed in the footing bottom to protect the soil surface, after properly preparing the surface to a level and stable condition. This layer shall be thoroughly compacted with a vibratory plate tamper or roller, and its surface shall not extend above the design bearing elevation.

### **Excavation**

The native soils may be excavated using conventional heavy equipment, such as tracked excavators and bulldozers. Occasional small boulders are expected in the soil, and some large boulders could also be present. No rock excavation is expected within the building area. Refer to the Subgrade Preparation section of this report for additional requirements.

The investigation indicates that the soils which will be encountered in the building excavation are likely to predominately be OSHA Type B, requiring a minimum slope of 1-to-1 in shallow excavations, with benching permitted, and OSHA Type C, requiring a minimum slope of 1.5 horizontal to one vertical in shallow excavations, with benching not permitted. Soil types for excavation requirements must be confirmed during construction.

Groundwater seepage rates in the building excavations are expected to be slow, but will likely be persistent, at least during wet seasons. Occasional zones of concentrated seepage may be encountered, and there may also be some initial short-term drainage of greater volume from zones of perched water. Groundwater seepage and stormwater should be removed promptly from the excavations. When dewatering excavations, the water level should be drawn down at a controlled rate, allowing the soil in the sides of the excavation to drain.

### **Fill Materials**

Soils excavated from the site are expected to be of good quality for re-use as fill and backfill for foundations, slabs and pavement areas. Boulders, large cobbles and topsoil must be excluded from the borrow fill, and the borrow material should be blended to a uniform grading. The borrow soil will probably require some drying prior to being placed and compacted.

If imported fill is used below foundations and slabs, it shall consist of granular material, i.e. imported Structural Fill, which shall be good-quality bank-run sand and gravel or crushed stone, and should comply with the gradation limits below. Structural Fill may also be used as foundation backfill. Structural Fill HD (Heavy Duty) should be used in areas to be protected from heavy construction traffic and where subgrade stabilization is needed.

Sieve size		Structural Fill Structural Fill HD	
Inch	mm	Percent Passing by Weight	
4"	100	100	100
1½"	37.5	50-100	50-90
#4	4.75	20-70	20-50
#40	0.425	5-50	5-25
#200	0.075	0-20 0-10	

All fill materials shall consist of sound, durable particles, shall be free from frost, garbage, construction debris or other deleterious material, and shall be substantially free from organic matter and roots. Recycled crushed concrete and masonry from a registered source may be acceptable for some applications, subject to approval by the Designer of Record. Fill shall not be placed over frozen or unstable soil, unless approved by the Engineer.

CLSM (Controlled Low-Strength Material, aka flowable fill or k-crete,) may be used under footings and foundations and may also be used to backfill trenches or other excavations, typically where rapid fill placement is required, fill areas are narrow, or the use of conventional compaction methods is not practical. For support of footings, a CLSM mix consisting of sand, cement and water, with a 56-day compressive strength of 50 to 200 psi, is appropriate. CLSM may produce high fluid pressures during placement, and caution must be used for placements against foundation walls, near unbraced cuts, etc. Pipes or tanks can also float if not properly restrained during placement. CLSM should not be placed against unprotected aluminum; CLSM containing flyash should not be used in contact with cast iron or ductile iron. Hardened CLSM masses may also adversely affect groundwater flow, possibly causing erosion under or along the CLSM, particularly in sloping trenches.

### Other Fill Materials:

- Crushed stone base course for slabs-on-grade and for footing drains should consist of ASTM C33 #5, #56 or #57 stone (¾-inch or ¾-¾-inch size.)
- Well-graded granular subbase material (NYSDOT Item 733-04 'Item 4' or similar) should be used under sidewalks and exterior slabs.

### Fill Placement and Compaction

Fill that is shallow over the native soil (less than two feet of cover) should be compacted with small to midsize equipment, such as vibratory trench rollers or single-drum soil rollers with a nominal size of five to seven tons. In areas with limited access, vibratory plate tampers or jumping-jack tampers may be used. Heavier equipment may be used over deep granular fill. Backfilling of foundation excavations should be completed prior to erection of building framing. Do not allow water to accumulate in footing excavations prior to backfilling.

Fill shall be placed in controlled lifts, with each lift compacted to the required density at a moisture content within two percent of optimum moisture, as determined by ASTM D1557. When the moisture content of the fill is within two percent of optimum, it may be placed in lifts with compacted thicknesses of up to twelve inches. If the moisture content is two to three percent from optimum, reduce the maximum thickness to eight inches, and if it is more than three percent from optimum, discontinue compaction. Use a reduced lift thickness if required to attain the specified percent compaction and when using small compaction equipment. If the fill is too dry, mix in water as the fill is spread; surface watering is typically ineffective.

Pipe bedding in utility trenches may act as groundwater flow routes during or after construction. Use well-graded bedding, or interrupt coarse granular bedding with occasional zones of compatible lower-permeability soil to control minor seepage. Avoid the use of excessively coarse pipe bedding material that can allow fines to wash in from the surrounding soil. Contact the Engineer if excessive groundwater is encountered.

Open-graded stone base course material for slabs-on-grade should be graded level and seated with one or more compaction passes, to help resist displacement during slab area preparation and concrete placement.

# **Compaction Requirements**

Compact each lift of fill supporting slabs or structures with at least six one-way compaction passes, even if the required compaction percentage is obtained with fewer passes. Each compaction pass shall be made at a slow walking speed (less than four feet per second,) with the equipment passing completely over all areas of the fill. Fill materials shall be compacted to at least the following percentage of the ASTM D1557 maximum dry density. For coarse-graded fill materials with more than thirty percent retained on the ¾-inch sieve, the ASTM D4253 Maximum Index Density test may be substituted for the D1557 test.

Minimum Percent Compaction	
Location	Minimum Percent
Below footings, foundations and slabs	95
Exterior Foundation Backfill, landscaped areas	90

# **Testing**

Prior to placement of fill or footings, the prepared subgrade shall be inspected to verify that it has been prepared in conformance with the requirements of this report. Compaction testing is required by Code and shall be performed for each lift of fill supporting footings. It is further recommended that inspection of the fill placement and compaction operations in general be performed, with compaction testing performed for fill supporting slabs and building-adjacent pavement and sidewalk areas. Recommended test procedures and frequencies are provided below.

**BEARING CAPACITY:** At this site, bearing capacity testing is recommended as part of the subgrade inspection if soft or otherwise suspect soil conditions are encountered. The soil throughout the bearing area shall be probed thoroughly to check for soft spots. Sudden changes or significant variations in bearing capacity should be evaluated. The surface shall be generally free from loose material, and the specified (design) bearing capacity as indicated by a Static Cone Penetrometer or equivalent device, when tested, shall be obtained within 3 inches of the surface in footing excavations. When tests are performed, they should be made at intervals of fifty feet or less in continuous footings, with at least one test on each footing line and in each isolated spread footing.

**COMPACTION TESTING:** Compaction tests of fill and backfill shall be performed at representative locations in each lift. In continuous footings and trenches, at least one test should be performed per 50 linear feet; one test should be performed at each isolated spread footing; and one test should be taken per 1000 square feet in slab areas, per lift. Compaction tests should be performed with a nuclear moisture-density gauge, per ASTM Test Method D6938, unless otherwise approved. Required percent compaction values are provided above.

**PROOF-ROLLING:** Observe the stability of the subgrade during preparation work. If the soil exhibits excessive deflection, rutting, or cracking, additional excavation, drying of the subgrade, and/or the use of lighter construction equipment may be required.

CLSM: When flowable fill is used to support footings or foundations, at least one set of four 6x12-inch test cylinders shall be cast from each day's placement, per ASTM D4832. Test three cylinders for unit weight and for compliance with the specified strength requirements. The fourth cylinder may be retained for later testing; cast additional cylinders if early tests are needed.

### **Geosynthetic Materials**

Geosynthetic materials are expected be used for reinforcement and drainage applications at the site on an as-needed basis, or where required by Code, such as for footing drains. Geosynthetic materials shall be installed over a smooth and evenly shaped subgrade, to avoid 'tenting' of the material over voids or high points. The geosynthetic shall be installed substantially free from wrinkles, and fill material shall be placed and spread in a manner which pushes the wrinkles out but which does not otherwise displace the geosynthetic material. Vehicles shall not drive on the exposed geosynthetics. The following material types are recommended, with typical examples of suitable products.

Drainage Separation: For footing drains and similar applications, a woven drainage geotextile with at least 4% open area, with an apparent opening size of 0.21mm (#70) or smaller, should be installed between the native soils and open-graded drainage zones. A suitable product is Carthage Mills "Carthage 6%." Non-woven geotextiles are not recommended for use in this application, due to the presence of fine particles in the native soil that will tend to clog the fabric.

Subgrade Reinforcement: Typically, a woven reinforcing geotextile such as TenCate Mirafi 600X should be used where needed to improve the stability of soft subgrade soils. Geogrids may be used instead of woven geotextiles, especially if free drainage is desired. A minimum of twelve inches of granular fill cover is typically required to mobilize the strength of the reinforcing geosynthetic.

Subgrade Separation: Where fines from the subgrade may infiltrate into an overlying granular layer, and strengthening of the subgrade and free vertical drainage are not required, a non-woven geotextile such as Mirafi S600 or 160N should be used.

Infiltration Barrier: Woven Reinforcement geotextile will act as an effective infiltration barrier when installed in a continuous horizontal layer. Non-woven Separation geotextile will also work as a barrier, when the overlying material in contact with it contains at least three percent silt and clay (passing the #200 sieve.)

### **Bearing Capacity and Soil Pressure**

Soil engineering properties for design are summarized in the tables below. The values assume that the building will be supported by a conventional spread footing foundation with slab-on-grade floor, as described in the previous sections, and will be provided with proper drainage.

Allowable Bearing Capacity, qa		
Footings bearing at least 42 inches below finished grade, with a minimum width of 12 inches	3000 psf	
Footings bearing at least 18 inches below finished grade, with a minimum width of 30 inches	3000 psf	
Minor Footings bearing at least 12 inches below finished grade, with a minimum width of 12 inches	2000 psf	
Allowable bearing values between 2000 and 3000 psf may be interpolated from the information above.		

Soil Properties	Native Soils
Soil Moist Density, $\gamma$ , lbs/cu ft	135
Lateral Bearing Capacity (psf per ft below grade)	230
Effective Internal Angle of Friction, Ø	34°
Coefficient of Friction (vs. concrete)	0.40
Coefficient of Active Earth Pressure, ka	0.28
Coefficient of Passive Earth Pressure, k <sub>p</sub>	3.54
Coefficient of At-Rest Earth Pressure, k <sub>o</sub>	0.44
Modulus of Subgrade Reaction, k, psi per inch	275

Footings subject to frost shall bear at least 42 inches below finished grade, or shall be otherwise protected from frost. Bearing elevations of footings shall be established such that a line drawn between the bottoms of two adjacent footings is not steeper than 30 degrees between the closest points on the footings. (Slope of 1 vertical to 1.75 horizontal.)

Up to one inch of settlement should be anticipated for the new foundation during construction, due to normal elastic compression of the soils below the footings. The expected magnitude of both total and differential settlement is about one-half inch.

### Control of Groundwater and Soil Gases

Minor groundwater seepage should be expected in foundation areas during and after construction. Conventional damp-proofing, including placement of slabs-on-grade over a vapor barrier and an open-graded stone base course, and installation of conventional footing drains and vertical foundation wall drainage are appropriate to control water seepage, and the grades are favorable for the use of gravity drainage. Vertical foundation drainage can be provided by installing drainage panels against the walls, or by placing a zone of clean, free-draining granular fill against the walls, to convey groundwater seepage to the footing drains at a controlled rate. Stormwater runoff must be directed away from the foundation and may not be directed to the footing drains.

Soil gases that could normally be expected to impact the structure are water vapor and radon. Thorough foundation damp-proofing, as noted above, placement of dense concrete in slabs-on-grade, (low water-to-cementitious ratio, thoroughly consolidated,) and sealing of all wall-to-slab joints, concrete cracks, pipe penetrations, drainage sumps, etc. are usually effective in controlling transmission of these gases to interior spaces. If an open-graded base course is used under the slab, a passive vapor mitigation system can be included, using small-diameter PVC pipes. The potential for these gases to adversely impact the use of the building is estimated to be low, if the above recommended practices are used, and normal interior ventilation is provided.

# Seismic and Expansive Properties

Seismic Design Values: In the absence of deep soil data from borings or from other geophysical measurements, the presumptive Seismic Site Class is "D, Stiff Soil." No conditions were observed or indicated that would warrant the use of a more restrictive class. For Site Class D, the following seismic design values were obtained from the current database maintained by the Applied Technology Council, Redwood City, Cal., which is consistent with the published maps in the Building Code. Values are provided in the table below (ASCE 7-16 data.) The seismic design values are based on the "risk adjusted maximum probable earthquake." These are not the maximum values that *could* occur, they are values that are not likely to be exceeded during the service life of a typical structure.

Occupancy Category	I/II/III	
Seismic Site Class	D, Stiff Soil (presumed)	
IBC Seismic Design Category	SDC-B	
Maximum Acceleration	$\begin{array}{c cccc} 0.2 \sec S_S & 0.240 \ g \\ 1.0 \sec S_1 & 0.057 \ g \end{array}$	
Maximum Spectral Response Acceleration	$ \begin{array}{c cccc} 0.2 \sec \ S_{MS} & 0.384 \ g \\ 1.0 \sec \ S_{M1} & 0.138 \ g \\ \end{array} $	
5% Damped Spectral Response	0.2 sec S <sub>DS</sub> 0.256 g 1.0 sec S <sub>D1</sub> 0.092 g	

**Liquefaction Potential:** The soils encountered in the investigation have low liquefaction susceptibility. The soils are dense and do not have texture/permeability combinations that are associated with loss of shear strength during anticipated seismic events. No special mitigation measures are required.

**Expansive Soils and Frost Heave:** The soils encountered in the investigation have a very low potential for expansion due to shrinking and swelling resulting from moisture changes. This behavior is typically associated with high-plasticity silt and clay soils. No mitigation measures are required. The on-site soils are moderately to highly susceptible to frost heave. Frost heave can be minimized by providing good drainage and by thoroughly compacting the soil. Well-graded granular fill should be used in areas where frost heave could result in damage.

# NOTES AND LIMITATIONS

Subsurface conditions encountered during construction shall be compared to the test pit logs and to this report; any significant variations from anticipated conditions must be evaluated for their effect on the design. This report summarizes the results of a limited investigation and does not purport to predict every variation in subsurface conditions.

This geotechnical investigation was conducted to evaluate the engineering properties of the soils at the site, to aid in the design of the proposed work. The investigation did not include evaluation of the potential effects of the proposed construction on other properties, nor did it include inspection of, or sampling for, items of environmental concern such as the presence of soil contaminants or of regulated wetlands, and did not include review of local zoning regulations, codes, floodplain boundaries or similar matters, unless specifically referenced in the report. This investigation was conducted solely for the use of the Client, the Client's Project Designers and Agents and the Authorities Having Jurisdiction; this report should not be used by others, nor for any use other than its stated purpose, without contacting the Engineer. Any such use is solely at the user's risk.



KEVIN L. PATTON, P.E.	CLIENT:	Town of Blooming Grove, N.Y.		
36 PATTON ROAD	PROJECT:	Senior Center		
NEWBURGH, NY 12550	DATE:	9/3/2021	Project No.:	21230
PATTONGEOTECH.COM 845 275-7732	WEATHER:	Sunny, 65F		

	TEST PIT LOG				
EXCAVATING COMPANY: OPERATOR:	Town Highway Department Bob	I I OCATION:	West side of proposed building, near parking lot	TEST PIT	TD1
EQUIPMENT:	Case Backhoe	ELEVATION:	350 approx.	NUMBER	111
INSPECTOR:	Kevin Patton	WATER DEPTH:	5.5 ft approx.		

Depth	USCS Class	Description	Notes
0-4 in.	CL-ML	Topsoil. Brown gravelly loam with trace organics, fine roots.	
4" to 2ft	SM	Sand with some silt, little gravel, few cobbles, trace small boulders. Pale yellowish brown.	
2ft -6.75ft	SM	Similar, brown. Sand with some silt, some gravel, few cobbles, trace small boulders. Static Cone Penetrometer indicates an allowable bearing capacity of 8000-plus pounds per square foot at 38 inches below grade.	
5.5 ft		Wet below 5.5 ft depth. Slow/moderate seepage; water was at minus-6 feet after fifteen minutes	





Test Pit 1 after completion, with seepage beginning to accumulate in the bottom.

Right: Spoils from Test Pit 1

KEVIN L. PATTON, P.E.	CLIENT:	Town of Blooming Grove, N.Y.	Υ.	
36 PATTON ROAD	PROJECT:	Senior Center		
NEWBURGH, NY 12550	DATE:	9/3/2021	Project No.:	21230
PATTONGEOTECH.COM 845 275-7732	WEATHER:	Sunny, 65F		

	TEST	PIT LOG			
EXCAVATING COMPANY:	Town Highway Department	LOCATION:	North end of proposed building,		
OPERATOR:	Bob	LOCATION.	near driveway	TEST PIT	TD1
EQUIPMENT:	Case Backhoe	ELEVATION:	346 approx.	NUMBER	112
INSPECTOR:	Kevin Patton	WATER DEPTH:	4.67 ft approx.		

Depth	<b>USCS Class</b>	Description	Notes
0-4 in.	CL-ML	Topsoil. Brown loam with traces gravel, grass roots.	
4" to 2.5ft	CL-ML	Silty clay with some sand, little to some gravel, few cobbles, trace small boulders. Pale yellowish brown.	
2.5 to 4 ft	SM	Sand with some silt, some gravel, few cobbles, trace small boulders. Brown.	
4 to 6 ft	GW-GM	Brown gravel and sand with traces silt, few cobbles, few small boulders.	
4.67 ft		Seepage from sides of test pit at 54 inches below grade and deeper. Slow seepage rate.	





Left: Test Pit 2 after completion, with minimal seepage in the bottom.

Right: Spoils from Test Pit 2.

# KEVIN L. PATTON, P.E. 36 PATTON ROAD NEWBURGH, NY 12550 845 275-7732 PATTONGEOTECH.COM

CLIENT:	Town of Blooming Grove, N.Y.		
PROJECT:	Senior Center		
PROJECT No.:	21230	SAMPLE LOT No.:	210903-1
DATE SAMPLED:	9/3/2021	DATE TESTED:	9/3/2021
SAMPLED BY:	Kevin Patton	TESTED BY:	Kevin Patton

MOISTURE CONTENT OF SOIL
TEST METHOD: ASTM D2216

LOCATION	DEPTH,FT.	% MOISTURE
TP 1	3 ft	11.0
TP 1	6 ft	13.0
TP 2	5 ft	10.6

Moisture content is expressed as a percent of the dry mass of the soil.

Reviewed by: Kevin Patton

# **KEVIN L. PATTON, P.E.**

# **36 PATTON ROAD**

# NEWBURGH, NY 12550

### 845 275-7732 PATTONGEOTECH.COM

CLIENT:	Town of Blooming Grove		
PROJECT:	Senior Center		
PROJECT No.:	21319	SAMPLE LOT No.:	210903-1
DATE SAMPLED:	9/3/2021	DATE TESTED:	9/14/2021
SAMPLED BY:	Kevin Patton	TESTED BY:	Wyeth Patton

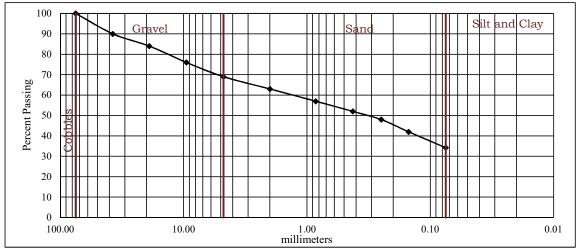
# **GRADATION ANALYSIS TEST REPORT**

TEST METHOD(s): ASTM D422, D1140, AASHTO T311

Sample Location	Test Pit 1
Depth	6 feet

Sieve	e Size	Percent Retained	Percent Passing	Specification
inches	mm	Fercent Retained	refeelit rassing	Specification
3"	75.0	0	100	See note.
1-1/2"	37.5	10	90	
3/4"	19.0	6	84	
3/8"	9.5	8	76	
#4	4.75	7	69	
#10	2.00	6	63	
#20	0.850	6	57	
#40	0.425	5	52	
#60	0.250	4	48	
#100	0.150	6	42	
#200	0.075	8	34.2	
Pa	an	34.2		
То	tal	100		

Percent passing #200 by wash-sieve method.



Particle type size ranges are per USCS Classification.

USCS Class*	SM, Silty Sand with Gravel	
*For soils with more than 5%	passing #200 sieve, Atterberg Limits were determined by:	Estimated (ASTM D2488)

Note: The in-situ soil contained cobbles and boulders.

# **KEVIN L. PATTON, P.E.**

### 36 PATTON ROAD

### NEWBURGH, NY 12550

# 845 275-7732 PATTONGEOTECH.COM

CLIENT:	Town of Blooming Grove		
PROJECT:	Senior Center		
PROJECT No.:	21319	SAMPLE LOT No.:	210903-1
DATE SAMPLED:	9/3/2021	DATE TESTED:	9/14/2021
SAMPLED BY:	Kevin Patton	TESTED BY:	Wyeth Patton

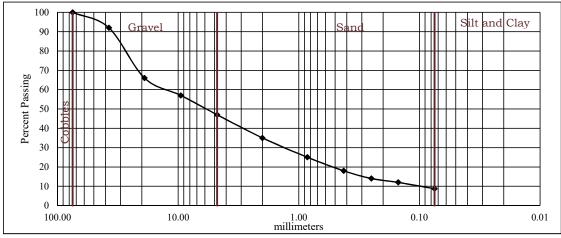
# GRADATION ANALYSIS TEST REPORT

TEST METHOD(s): ASTM D422, D1140, AASHTO T311

Sample Location	Test Pit 2
Depth	5 feet

Sieve Size		Percent Retained	Percent Passing	Specification
inches	mm	rercent Retained	Percent Passing	Specification
3"	75.0	0	100	See note.
1-1/2"	37.5	8	92	
3/4"	19.0	26	66	
3/8"	9.5	9	57	
#4	4.75	10	47	
#10	2.00	12	35	
#20	0.850	10	25	
#40	0.425	7	18	
#60	0.250	4	14	
#100	0.150	2	12	
#200	0.075	3	8.7	
Pan		8.7		
Total		100		

Percent passing #200 by wash-sieve method.



Particle type size ranges are per USCS Classification.

D60 (millimeters)	13	Uniformity Coefficient (Cu)		137	
D30	1.30	Coefficient of Curvature (Cc)		1.37	
D10 (Effective Size) 0.09		USCS Class*	GW-GM, Well-graded Gravel with Sand		
*For soils with more than 5% passing #200 sieve, Atterberg Limits were determined by: Estimated (ASTM D2488					

Note: The in-situ soil contains cobbles and boulders.

# KEVIN L. PATTON, P.E. 36 PATTON ROAD NEWBURGH, N.Y. 12550 845 275-7732 PATTONGEOTECH.COM

# Soil Technical Notes:

Soil Classifications, Descriptions and Properties

**The USCS** (Unified Soil Classification System) was used to classify the soils in this report. The USCS is described in ASTM D2487 (laboratory test method) and D2488 (visual-manual method.) The USCS classification gives a 'Group Symbol' and 'Group Name' based on particle size distribution (gradation,) clay properties (Atterberg Limits) and basic composition (mineral or organic.)

# **USCS Soil Classes**

Soils with less than 5% passing the #200 sieve:

GW, GP, SW, SP - Well-graded gravel, Poorly-graded gravel, Well-graded sand, Poorly-graded sand.

Soils with 12% to 50% passing the #200 sieve:

GC, GM, GC-GM, SC, SM, SC-SM – Clayey gravel, Silty gravel, Silty clayey gravel, Clayey sand, Silty sand, Silty clayey sand.

<u>Soils with 5% to 12% passing the #200 sieve</u> use a dual symbol, such as SW-SC (Clayey well-graded sand.) <u>Soils with more than 50% passing the #200 sieve</u>:

CL-ML, ML, CL, MH, CH, OL, OH – Silty clay, Silt, Lean clay, Elastic silt, Fat clay, Organic silt, Organic clay. Highly organic soils:

PT – Peat.

The soil group name is modified with the term 'with sand' or 'with gravel' added if the soil contains more than 15% of these materials; clays and silts with 30% or more plus-#200 material are described as 'sandy' or 'gravelly' (whichever is predominate.) Examples – GM. Silty gravel with sand: CL. Gravelly lean clay.

predominate.) Examples – GM, Silty gravel with sand; CL, Gravelly lean clay.							
Particle size	Fine- and Coarse-grained Soils	Atterberg Limits					
>12" (300mm) Boulders	The USCS classification applies to the	Test is performed on the clay, silt					
12" to 3" (300-75mm) Cobbles	material smaller than the 3-inch sieve.	and fine sand fraction of the soil:					
3" to #4 (75-4.75mm) Gravel		Liquid Limit (LL) – moisture content					
#4 to #200 (4.75-0.075mm) Sand	'Fine-Grained Soils' (silts and clays)	(%) at which soil becomes very soft.					
<#200 (0.075mm) Silt & Clay		Plastic Limit (PL) – moisture content					
Organic Soils	sieve and are classified by their	at which soil crumbles.					
Highly organic soils such as peat are	Atterberg Limits.	Plasticity Index (PI) = LL minus PL					
visually classified. Partly organic soils, with a mix of organic and mineral matter, are classified visually and by Atterberg Limits tests.	'Coarse-Grained Soils' (sands and gravels) have less than 50% passing the #200 sieve. When more than 50% of the plus-200 material is retained on the #4	Higher PI values may indicate reduced permeability and increased drying shrinkage.					
Moisture Content	sieve the general soil type is gravel, and	LL > 50 indicates soil with a higher					
Moisture is visually estimated and	if more than 50% is finer than the #4	potential to shrink and swell due to					
samples are usually tested. Soil	sieve, it is sand.	changing moisture content.					
moisture capacity varies with texture and compaction.  Typical examples: GW, moist at 3%, saturated at 9% SP, moist at 6%, saturated at 20%. CL, moist at 12%, saturated at 33%.	Clean coarse-grained soils are classified as well-graded (Classes GW, SW) or poorly-graded (GP, SP.) Well-graded soils have a wider range of sizes and are typically more stable. Poorly-graded soils are usually more permeable.	Silts have lower PI values, and behave like very fine sand; most silts also contain some clay. Behavior of clays is partly controlled by electrochemical forces and varies among the several clay minerals.					
Color	Relative Quantities	USDA Soil Classification					
Soil color sometimes indicates	Estimated percentages in descriptions:	USDA classifications are based on					
groundwater conditions, with	<5% - Trace	the relative amounts of sand, silt and					
subdued colors below the water table	5-10% - Traces	clay in the soil fraction passing the					
and mottled (mixed) colors in the	10-25% - Little #10 (2mm) sieve. 'Gravelly'						
zone of seasonal water table	25-35% - Some	more than 15% of #10 to 3" size.					
fluctuation. Color changes tend to be	'And' - Approx. equal amounts	'Channery' indicates 15 to 35% thin					
more prominent in fine-grained soils.	'Few' - <10% (cobbles and boulders)	flat pieces up to 6" long.					



### MAP LEGEND

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**Water Features** 

Background

Spoil Area

Stony Spot

Wet Spot

Other

Very Stony Spot

Special Line Features

Streams and Canals

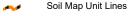
Topographic Map

### Area of Interest (AOI)

Area of Interest (AOI)

### Soils

Soil Map Unit Polygons



Soil Map Unit Points

### Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

▲ Lava Flow

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

# MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15.800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, New York Survey Area Data: Version 21, Jun 11, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

# **Map Unit Legend**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ab	Alden silt loam	47.1	4.1%
BnB	Bath-Nassau channery silt loams, 3 to 8 percent slopes	6.2	0.5%
CnA	Chenango gravelly silt loam, 0 to 3 percent slopes	7.2	0.6%
CnB	Chenango gravelly silt loam, 3 to 8 percent slopes	3.9	0.3%
ErA	Erie gravelly silt loam, 0 to 3 percent slopes	44.6	3.9%
ErB	Erie gravelly silt loam, 3 to 8 percent slopes	172.3	14.9%
ESB	Erie extremely stony soils, gently sloping	13.6	1.2%
Fd	Fredon loam	3.7	0.3%
MdB	Mardin gravelly silt loam, 3 to 8 percent slopes	417.8	36.1%
MdC	Mardin gravelly silt loam, 8 to 15 percent slopes	280.4	24.3%
MdD	Mardin gravelly silt loam, 15 to 25 percent slopes	37.2	3.2%
My	Middlebury silt loam	9.4	0.8%
UH	Udorthents, smoothed	3.0	0.3%
W	Water	54.2	4.7%
Wd	Wayland soils complex, non- calcareous substratum, 0 to 3 percent slopes, frequently flooded	55.1	4.8%
Totals for Area of Interest	·	1,155.8	100.0%

## **Engineering Properties**

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Hydrologic soil group is a group of soils having similar runoff potential under similar storm and cover conditions. The criteria for determining Hydrologic soil group is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx? content=17757.wba). Listing HSGs by soil map unit component and not by soil series is a new concept for the engineers. Past engineering references contained lists of HSGs by soil series. Soil series are continually being defined and redefined, and the list of soil series names changes so frequently as to make the task of maintaining a single national list virtually impossible. Therefore, the criteria is now used to calculate the HSG using the component soil properties and no such national series lists will be maintained. All such references are obsolete and their use should be discontinued. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonal high water table, saturated hydraulic conductivity after prolonged wetting, and depth to a layer with a very slow water transmission rate. Changes in soil properties caused by land management or climate changes also cause the hydrologic soil group to change. The influence of ground cover is treated independently. There are four hydrologic soil groups, A, B, C, and D, and three dual groups, A/D, B/D, and C/D. In the dual groups, the first letter is for drained areas and the second letter is for undrained areas.

The four hydrologic soil groups are described in the following paragraphs:

*Group A.* Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

*Group B.* Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

*Group C.* Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

*Group D.* Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

*Depth* to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Percentage of rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Liquid limit and plasticity index (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

#### References:

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

## **Report—Engineering Properties**

Absence of an entry indicates that the data were not estimated. The asterisk '\*' denotes the representative texture; other possible textures follow the dash. The criteria for determining the hydrologic soil group for individual soil components is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

	Engineering Properties-Orange County, New York													
Map unit symbol and	Pct. of	Hydrolo	Depth	USDA texture	Classi	fication	Pct Fra	gments	Percent	age passi	ng sieve r	number—	Liquid	Plasticit
soil name	map unit	gic group			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200	limit	y index
			In				L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H
ESB—Erie extremely stony soils, gently sloping														
Erie, extremely stony	80	D	0-4	Gravelly silt loam	GM, ML, SM	A-2, A-4	1- 5- 8	0- 2- 5	65-85- 90	50-75- 75	35-65- 70	20-60- 65	30-35 -40	5-8 -10
			4-18	Channery fine sandy loam, channery silt loam, channery loam	CL-ML, CL, GC, SC	A-1, A-2, A-4	0- 0- 2	0- 2- 10	65-85- 90	50-75- 75	35-65- 70	20-55- 65	15-20 -25	5-8 -10
			18-50	Channery silt loam, channery silty clay loam, very channery loam	CL, GC, SC	A-2, A-6	0- 2- 5	0- 2- 20	50-80- 85	35-70- 70	25-65- 70	20-55- 65	25-30 -35	10-13-1 5
			50-70	Channery silt loam, channery silty clay loam, very channery loam	CL, GC, SC	A-2, A-6	0- 2- 5	0- 2- 25	50-80- 85	35-70- 70	25-65- 70	20-55- 65	25-30 -35	10-13-1 5

	Engineering Properties-Orange County, New York													
Map unit symbol and	Pct. of	Hydrolo	Depth	USDA texture	Classi	fication	Pct Fra	gments	Percent	age passi	ng sieve i	number—	Liquid	Plasticit
soil name	map unit	gic group			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200	limit	y index
			In				L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H
MdB—Mardin gravelly silt loam, 3 to 8 percent slopes														
Mardin	85	D	0-8	Silt loam, gravelly silt loam, channery silt loam, channery loam	GC-GM, MH, ML	A-2-4, A-4, A-7-5	0- 0- 3	0- 4- 19	43-70- 90	41-68- 90	33-62- 89	28-54- 82	27-35 -56	6-9 -16
			8-15	Flaggy silt loam, channery loam, silt loam, loam, channery silt loam, gravelly silt loam, gravelly loam	GC-GM, CL	A-2-4, A-4, A-6	0- 0- 3	0- 4- 18	44-71- 91	41-69- 90	34-61- 88	28-54- 81	22-27 -38	6-9 -15
			15-20	Channery loam, silt loam, loam, channery silt loam, gravelly silt loam, gravelly loam	CL-ML, CL, GM	A-2-4, A-4, A-6	0- 0- 3	0- 4- 18	46-72- 91	43-71- 91	34-63- 88	26-51- 77	17-23 -32	2-7 -12
			20-72	Very flaggy silt loam, very flaggy loam, very channery loam, very channery silt loam, channery loam, channery silt loam, gravelly loam, gravelly silt loam	CL, GM	A-1-b, A-6	0- 3- 17	3- 6- 40	33-74- 82	30-73- 81	23-63-80	18-55- 73	16-28 -35	2-12-17

## **Data Source Information**

Soil Survey Area: Orange County, New York Survey Area Data: Version 22, Aug 29, 2021

#### APPENDIX II

#### REFERENCE DRAWINGS



ACCESSIBILITY NOTES:

1. ACCESS TO BUILDING FOR PERSONS IN WHEELCHAIRS IS DESIGNED BY AND FIELD BUILT BY OTHERS AND SUBJECT TO LOCAL JURISDICTION. THE PRIMARY ENTRANCE AND REQUIRED EXTS MUST BE ACCESSIBLE. ALL BUILDING ELEMENTS AND FACUITIES SHALL BE ACCESSIBLE IN ACCORDANCE WITH THE REFERENCE ACCESSIBLE TRANSAMOR(S) EXCEPT WHERE SPECIFICALLY EXEMPTED BY THE SCOPING REQUIREMENTS OF THE APPLICABLE CODE.

THE INTERNATIONAL SYMBOL OF ACCESSIBILITY SION SHALL BE DISPLAYED AT ALL ACCESSIBLE RESTROOM FACULTIES AND AT ACCESSIBLE BUILDING ENTRANCES
UNLESS ALL ENTRANCES ARE ACCESSIBLE. INACCESSIBLE ENTRANCES SHALL HAVE DIRECTIONAL SIGNS INDICATING THE ROUTE TO THE NEAREST ACCESSIBLE
FINEMACE. AT LEAST RONG OF ALL PUBLIC ENTRANCES SHILLS THE ACCESSIBLE

3. ALL SIGNS REQUIRED TO BE ACCESSIBLE BY THE SCOPING REQUIREMENTS OF THE APPLICABLE CODE SHALL COMPLY WITH THE APPLICABLE PORTIONS OF SECTION 703 OF THE ACCESSIBILITY CODE. ALL SUCH SIGNS ARE DESIGNED BY OTHERS, SITE INSTALLED AND SUBJECT TO THE APPROVAL OF THE JURISDICTION HAVING

A LOCKESTILL DRINKING FOUNTAINS SHALL HAVE A SPOUT DUTLET HEIGHT NO HOHER THAN 36 INCHES ABOVE THE FLOOR AND SPOUT SHALL BE LOCATED IS NOT THE FLOOR AND SPOUT SHALL BE LOCATED IS NOT WASTER 4 RIGHES RIGHT MINIMAL. ANGLE OF WAITES STREAM SHALL BE IN ACCORDANCE WITH THE APPLICABLE ACCESSIBILITY CODE. DRINKING FOUNTAINS FOR STANDING PERSONS SHALL HAVE A SPOUT OUTLET HEIGHT 38 INCHES MINIMAL AND AS LOCES MANAUL ABOVE THE FLOOR.

S IMPRES TRANSPA STIMLAL HOTELS, A SCANE TO SELECT A SERVICES MEMBERS AND STUTES MEMBERS ARRIVE THE TUDY.

S IMPRES TRANSPA FAULIES SUIT AS CARRENTS SELECTS, COSETS, AND DEARERS ARE PROVIDED AT LEAST ONC OF EACH TYPE PROVIDED SHALL CONTAIN STORAGE SPACE COMPLINE WITH THE FOLLOWING: DOORS, ETC. TO SUICH SPACES SHALL BE ACCESSIBLE (La TOUGH LATCHES, U-SHAPED PILLS); FOR APLAS WITH LINGS SIMMAN AND 48 HONES MANAMAN OF THE TRANSPAR SHAPED SHALL SHAPED SHAPE

6. CONTROLS, DISPENSERS, RECEPTACLES AND OTHER OPERABLE EQUIPMENT SHALL BE NO HIGHER THAN THE REACH HEIGHTS SPECIFIED IN NOTE 5 ABOVE AND NO LESS THAN 15 INCHES ABOVE THE FLOOR. EXCEPTION: HEIGHT LIMITATIONS DO NOT APPLY WHERE THE USE OF SPECIAL EQUIPMENT DICTATES OTHERWISE OR WHERE ELECTRICAL RECEPTACLES ARE NOT NORMALLY INTRODED FOR USE BY BUILDING OCCUPANTS.

7. WHERE EMERGENCY WARNING SYSTEMS ARE PROVIDED, THEY SHALL INCLUDE BOTH AUDIBLE AND VISUAL ALARMS. THE VISUAL ALARMS SHALL BE LOCATED THROUGHOUT, INCLUDING RESTROOMS, AND PLACED IN ACCORDANCE WITH MFPA 72.

8. DOORS TO ALL ACCESSIBLE SPACES SHALL HAVE ACCESSIBLE HARDWARE (i.e. LEVER-OPERATED, PUSH-TYPE, U-SHAPED) MOUNTED NO HIGHER THAN 48 INCHES ABOVE THE FLOOR.

9. FLOOR SURFACES SHALL BE STABLE, FIRM, AND SUP-RESISTANT. CHANGES IN LEVEL BETWEEN 0.25 INCH AND 0.5 INCH SHALL BE BEVELED WITH A SLOPE NO GREATER THAN 1.2. CHANGES IN LEVEL GREATER THAN 0.5 INCH REQUIRE RAMPS. CARPET PILE THICKNESS SHALL BE 0.5 INCH MAX. GRATINGS IN FLOOR SHALL BE SPACES NO GREATER THAN 0.5 INCH WIDE IN ONE PRECTION. DOORWAY THRESHOLDS SHALL NOT EXCEED 0.5 INCH IN HIGHT.

10. ALL DOORS SHALL BE OPENABLE BY A SINGLE EFFORT. THE MAXIMUM FORCE REQUIRED TO OPEN A DOOR SHALL NOT EXCEED 8.5 LBS. FOR EXTERIOR SWINGING DOORS AND 5 LBS. FOR ALL SLIDING, FOLDING, AND INTERIOR SWINGING DOORS.

11. DOORS AND SIDELITES ADJACENT TO DOORS CONTAINING ONE OR MORE GLAZING PANELS THAT PERMIT VIEWING THROUGH THE PANELS SHALL HAVE THE BOTTOM OF AT LEAST ONE PANEL ON BITHER THE DOOR OR AN ADJACENT SIDELITE 43 INCHES MAXIMUM ABOVE THE FLOOR. WISION LITES WITH THE LOWEST PART MORE THAN 66 NOISES ABOVE THE FLOOR ARE EXEMPT FROM THIS REQUIREMENT.

12. WHERE GLAZED OPENINGS ARE PROVIDED IN ACCESSIBLE ROOMS OR SPACES FOR OPERATION BY OCCUPANTS, AT LEAST ONE OPENING SHALL BE ACCESSIBLE. OPERABLE PARTS SHALL BE OPERABLE WITH ONE HAND AND SHALL NOT REQUIRE TIGHT GRASPING, PROHING, OR TIMISTING OF THE WRIST. THE FORCE REQUIRED TO ACTIVATE OPERABLE PARTS SHALL BE FOR PARTS SHALL BE FOLOWED WARML. OPERABLE PARTS SHALL BE FOLOWED WHITE A BROWLE.

AL ACCESSING WATER CLOSETS SHALL BE 17 INCHES TO 19 INCHES FROM THE FLOOR TO THE TOP OF THE SEAT. GAME BARS SHALL BE 38 INCHES LONG MINIMUM WHEN LOCATED BEHIND WATER CLOSET, AND DAY LONG THE OWNER WATER CLOSET, AND THE FLOOR TO THE TOP OF THE CREWFAR GAME AND SHALL SEE WANDER WATER CLOSET, AND SHALL BE WANDING THE FAR BOLL OCATED A MAXIMUM OF 10 SHOCKES FROM THE FLOOR TO THE TOP OF THE CREWFAR GAME AND SHALL SEE WASHING THE WATER CLOSET, WERE WALL SPACE DOES NOT PERMIT A GAME BARS 36 HE FROM THE TO THE TOP OF THE SHALL SHA

14, F 03 OF 09 AND 4171 IS SHOWN UNDER ACCESSBUT IN THE CODE SUMMARY, A MERICAL GAME BAR IS INCIRES WINNAM IN LENGTH SHALL BE MOUNTED THE SECTION OF THE WATER COSTS DIRECTLY ROPE THE 42 NICH COST (ORIGINATION CARE BAR. THE MERICAL BAN SHALL BE WOUNTED THIS FOR THE CARE AND THE MERICAL BAN SHALL BE WOUNTED THIS FOR THE CARE AND THE CARE AND THE SHARE AND SHARE SHARE SHARE AND HORES ABOVE THE CLOSE, AND WITH THE CAREFAIRM OF THE ARE CAREFAIRED.

15. ACCESSIBLE LAYATORES AND SINKS SHALL BE MOUNTED WITH THE RIM NO HIGHER THAN 34 INCHES ABOVE THE FLOOR AND A CLEARANCE OF AT LEAST 27 INCHES ABOVE THE FLOOR, AND B INCHES MINISTRUM IN DEPTH AT 9 INCHES ABOVE THE FLOOR, AND B INCHES MINISTRUM IN DEPTH AT 27 INCHES ABOVE THE FLOOR, INCHES THE PLANTIES THE OF EXPORTED THE OFFINITE TO BE REPORTED TO BE REPORTED.

16. HOT WATER AND DRAIN PIPES UNDER ACCESSIBLE LAVATORIES AND SINKS SHALL BE INSULATED OR OTHERWISE CONFIGURED TO PROTECT AGAINST CONTACT, INSULATION OR PROTECTION MATERIALS MAY BE SITE INSTALLED. THERE SHALL BE NO SHARP OR ABRASIVE SURFACES UNDER ACCESSIBLE LAVATORIES AND SINKS

- 17. ACCESSIBLE LAVATORIES AND SINKS SHALL HAVE ACCESSIBLE FAUCETS (i.e. LEVER-OPERATED, PUSH-TYPE, ELECTRONICALLY CONTROLLED).
- 18. WHERE MIRRORS ARE PROVIDED IN RESTROOMS, AT LEAST ONE SHALL BE PROVIDED WITH ITS BOTTOM EDGE NO HIGHER THAN 40 INCHES ABOVE THE FLOOR.
- 19. Grab bars required for accessibility shall be 1.25 inch to 2 inches in diameter with 1.5 inches of clear space between the bar and the wal 20. TOLET PAPER DISPINSERS SHALL BE INSTALLED 7. INDESSES MINIOUM AND DISPINSERS IN PRODUCT OF THE DISPINSERS SHALL BE INSTALLED 7. INDESSES MINIOUM AND DISPINSER. THE OUTLIET OF THE DISPINSER SHALL BE IN BIGGES MINIOUM AND DISPINSER. THE OUTLIET OF THE DISPINSER SHALL BE IN BIGGES MINIOUM AND DISPINSER SHALL BE IN DISPINSER SHALL BE IN BIGGES MINIOUM AND DISPINSER SHALL BE INCORTED MINIOUM AND DISPINSER IN LOCATED MINIOUM AND DISPINSER IN LOCATED MINIOUM AND DISPINSER IN LOCATED BIGGINE IN CONTROL OF THE DISPINSER SHALL BE IN OUTLIET OF THE DISPINSER SHALL BE IN COLTED BIGGINE HE DISPINSER IN A MARKE 24 INDESS MINIOUM FROM THE REAR WALL, AND THE DISPINSER'S SHALL BE IN OUTLIED THE DISPINSER SHALL BE IN OUTLIED BIGGINE MINIOUM AND DISPINSER IN DISPINSER IN DISPINSER IN DISPINSER IN A MARKE 24 INDESS MINIOUM BIGGINE MINIOUM AND DISPINSER IN DISPINSER IN DISPINSER IN A MARKE 24 INDESS MINIOUM BIGGINE MINIOUM AND DISPINSER IN DISPINSER IN A MARKE 24 INDESS MINIOUM BIGGINE MINIOUM BIGGINERY, OR THAT DO NOT PERMIT DON'THOUGH USE USED.
- 21. WATER CLOSET FLUSH CONTROL SHALL BE MOUNTED ON THE WIDE SIDE OF THE TOILET AREA.
- 22. A TOWEL DISPENSER SHALL BE LOCATED ADJACENT TO ALL ACCESSIBLE LAVATORIES
- 23. DOORS TO TOILET COMPARTMENTS LOCATED INSIDE MULTI-STATION RESTROOMS SHALL BE SELF-CLOSING
- 24. ACCESSIBLE URINALS SHALL BE STALL-TYPE OR WALL HUNG WITH ELONGATED RIMS AT A MAXIMUM OF 17 INCHES ABOVE THE FLOOR AND 13.5 INCHES FROM THE WALL
- 25. THE SHOWER SEAT SHALL BE MOUNTED 17 INCHES TO 19 INCHES FROM THE BATHROOM FLOOR AND SHALL EXTEND THE FULL DEPTH OF THE STALL.
- 28. A SHOWER SPRAY UNIT WITH A HOSE AT LEAST 60 INCHES LONG THAT CAN BE USED BOTH AS A FIXED SHOWER HEAD AND AS A HAND-HELD SHOWER SHALL BE PROVIDED. SHOWER SPRAY CONTROL SHALL BE EQUIPPED WITH AN ON/OFF SWITCH AND SHALL LIMIT TEMPERATURE TO 110°F (43°C).
- 28. ENCLOSURES FOR SHOWER STALLS SHALL NOT OBSTRUCT CONTROLS OR OBSTRUCT TRANSFER FROM WHEELCHAIRS ONTO SHOWER SEATS.
- 29. ALL KITCHEN APPLIANCES AND WORK SURFACES ARE SITE INSTALLED AND DESIGNED BY OTHERS. APPLIANCES AND ACCESS TO APPLIANCES SHALL COMPLY WITH ALL APPLICABLE ACCESSIBILITY REQUIREMENTS.

#### MECHANICAL NOTES:

1. ALL SUPPLY AIR REGISTERS SHALL BE 24 INCHES X 24 INCHES ADJUSTABLE WITH 20 INCHES X 10 INCHES X 18 INCHES NISDE) OVERHEAD FIBERCIASS DUCT, UNICESS OTHERWISE, SPECIFICIA. AT T-GRID CELLINGS THE FLEX DUCT FROM MAIN SUPPLY AIR DUCT TO SUPPLY AIR REGISTERS SHALL BE 8'0 (6'0 INSIDE) UNLESS OTHERWISE SPECIFICIA.

2. ALL RETURN AR REGISTES SHALL BE 24 NOVES X 24 NOVES ADJUSTABLE WITH 20 NOVES X 10 NOVES (18 NOVES X 8 NOVES NOSDE) OVERHEAD FRERDLASS DUCT, NULSS ORBERNES SPECIFED, WERE ATTO DUCTS STIB DOWN INTO WALL PLEASURS THE STIB DOWN OPENING 37.2 SHALL BE THE LOWS DUBLISHOON OF THE DUCTS OF 8 NOVES NUMBAU OF THE PLAL WORD FOR THE EDUNA, WHOREVER IS GREATER. ALL RETURN AS WALL BE LINED WITH 1/2 NOVE OPPOSING BOARD. AT T-GRID CELLINGS THE FLEX DUCT FROM MAIN RETURN AR DUCT TO RETURN AS WALL BELONG WITH 1/2 NOVE OPPOSING BOARD. AT T-GRID CELLINGS THE FLEX DUCT FROM MAIN RETURN AR DUCT TO RETURN AR REGISTERS SHALL BE 10\*6 (8\*9 INSDE) UNLESS OTHERWISE SPECIFED.

4. FIBERGLASS DUCTS SHALL BE CONSTRUCTED WITH CLASS 0 OR CLASS 1 DUCT MATERIAL IN ACCORDANCE WITH UL 181. FIBERGLASS DUCT CONSTRUCTION AND INSTALLATION SHALL CONFORM TO THE SMACHA FIBROUS GLASS DUCT CONSTRUCTION STANDARDS OR MAIN FIBROUS GLASS DUCT CONSTRUCTION STANDARDS — HAVE A PROPERTY OF THE SMACHA FIBROUS CONSTRUCTION STANDARDS — HEAT, AND FIZERBE, E. FLESBE ARR DUCTS, BOTHER DUCTS, SHALL BE CONSTRUCTED AS SECONDARIC WITH THE MAINTAIN SHALL BE LISTED AND LIBERD AS CLASS 0 OR CLASS 1 FLESBE ARR DUCT. ALL DUCTS SHALL BE INSTALLED IN ACCORDANCE WITH THE MAINTAINCENTRY SHALLADIN INSTRUCTION STANDARDS— HEAT SHALL BY A RECORDANCE WITH THE MAINTAINCENTRY SHALLADIN INSTRUCTION.

5. INTERIOR DOORS FROM ROOMS NOT PROVIDED WITH RETURN AIR REGISTERS SHALL BE UNDERCUT 1.5 INCHES ABOVE FINISHED FLOOR FOR AIR RETURN UNLES NOTED OTHERWISE ON FLOOR PLAN, EXCEPT DOORS LOCATED IN FIRE RATED PARTITIONS SHALL NOT BE UNDERCUT.

- 6. VENT FANS SHALL BE DUCTED TO THE EXTERIOR AND TERMINATE AT AN APPROVED VENT CAP.
- 7. HVAC EQUIPMENT SHALL BE EQUIPPED WITH OUTSIDE FRESH AIR INTAKES AS SPECIFIED ON THE MECHANICAL PLAN 8. HVAC SYSTEM SHALL COMPLY WITH NEPA 90A.

9. THERMOSTATS SHALL BE PROGRAMMABLE AS REQUIRED BY THE APPLICABLE ENERGY CODE. IF PROGRAMMABLE THERMOSTATS ARE NOT INSTALLED IN THE FACTORY THEY SHALL BE PROVIDED BY THE BUILDING OWNER AND SITE INSTALLED BY OTHERS. 10. THIS BUILDING HAS BEEN DESIGNED TO COMPLY WITH THE FRESH AIR REQUIREMENTS OF THE APPLICABLE MECHANICAL CODE. THE HAIC SYSTEM MAY NOT BE CAPABLE OF COMPOULING STANDARD HAMOITY, COOLING AND HIGTING COMPOSITE LEVELS DURING CERTINA DISSON CONSTITUNCE, BY ACCEPTANCE AND USE OF THIS DESIGNED WHITE RECEIVED HE DURING SEGNACE OF ALL PROPERTY OF DIRECT STANDARD OF THE MECHANICAL STATEMENT COMPITAING ARE MESSED BY THE DWINE OF REQUIRED WITH AURISON.

#### CODE SUMMARY ELECTRICAL MECHANICAL PLUMBING ACCESSIBILITY STATE BUILDING

#### GENERAL NOTES:

1. ALL CONSTRUCTION, MATERIALS, AND INSTALLATION SHALL BE IN ACCORDANCE WITH THE CODES SPECIFIED ON THESE DRAWINGS.

THESE PLANS INCLUDE DESIGN FOR THE FACTORY BUILT PORTION OF THE MODULAR STRUCTURE AND PORTIONS OF THE SITE BUILT CONSTRUCTION. THESE PLANS AND ON PLANS FOR ALL ELEMENTS DESIGNATED TO BE DESIGNED BY OTHERS AND/OR SITE INSTALLED MUST BE SUBMITTED TO AN DERVIEWED BY THE DESIGN PROFESSIONS.

FOR SPONSBILE CHARGE (DESIGNEE) OF RECORDS) FOR COMPATIBILITY WITH THE DESIGN OF THE OFFERAL BUILDING PROJECT AS REQUIRED BY THE APPLICABLE COORS AND

3. ALL PARTIES RESPONSIBLE FOR DESIGN WORK SHALL BE QUALIFIED AND LICENSED AS REQUIRED BY THE JURISDICTIONS HAVING AUTHORITY OR SHALL RETAIN SUCH QUALIFIED AND LICENSED ENTITIES TO PERFORM SUCH WORK.

4. TRANSPORTATION AND ERECTION OF THIS BUILDING IS DESIGNED BY OTHERS. DESIGNER OF THESE PLANS HAS NOT EVALUATED ANY TRANSPORTATION AND/OR LIFTING ELEMENTS SHOWN IN THESE PLANS, THESE ITEMS MUST BE EVALUATED BY TRANSPORTATION AND ERECTION DESIGNER FOR SUITABILITY. REFER TO MANUFACTURER'S APPROVED SYSTEMS PACKAGE FOR ADDITIONAL CONSTRUCTION DETAILS AND SPECIFICATIONS NOT INCLUDED IN THESE PLANS

6. REFER TO ATTACHED ENERGY CODE COMPLIANCE FORM AND CHECKLIST FOR ADDITIONAL ENERGY CODE CONSTRUCTION REQUIREMENTS NOT INCLUDED IN THESE PLANS. 7. ALL DODGE SHALL BE CEPAMAE FROM THE CREEKS DEC WINGUT THE USE OF A NY. TOLD, SECOLAL MOVIMEDER OF FEFOR IT, MANUALLY OFBITIES THUS RECUSS SEMENCES DATES SHALL HOT REL USED. DODGES THAT O'BERN THE O'BERN THE

8. WHEN NOT SHOWN ON THE PLANS PROVISIONS FOR EXIT DISCHARGE LIGHTING (INCLUDING DUAL ELEMENT EXIT DISCHARGE EMERGENCY LIGHTING) ARE DESIGNED BY OTHERS AND THE RESPONSIBILITY OF THE BUILDING OWNER AND SUBJECT TO LOCAL JURISDICTION APPROVAL.

9. PORTABLE FIRE EXTINGUISHERS SHALL BE PROVIDED BY OTHERS AS REQUIRED BY THE IFO 10. ALL GLAZING WITHIN A 24 INCH ARC OF DOORS WHOSE BOTTOM EDGE IS LESS THAN 60 INCHES ABOVE THE FLOOR AND ALL GLAZING IN DOORS SHALL BE SAFETY GLASS.

11. WHERE EGRESS THROUGH INTERVENING SPACE(S) EXIST AND ARE PERMITTED, SUCH SPACE(S) SHALL PROVIDED A DISCERNABLE PATH OF EGRESS TRAVEL TO THE EXIT. THE PATH SHALL MEET ALL CODE REQUIRED EXIT ACCESS CRITERIA. ALL SUCH EGRESS IS SUBJECT TO INSPECTION AND APPROVAL BY THE JURISDICTION HAVING

12. INTERIOR NON-LOADBEARING PARTITIONS SHALL BE MINIMUM 2X4 SYP#2 STUDS AT 16 INCHES ON CENTER UNLESS OTHERWISE SPECIFIED.

13. THIS BUILDING SHALL NOT BE INSTALLED AT ANY LOCATION WHERE THE SNOW LOAD ADOPTED BY THE JURISDICTION HAVING AUTHORITY OR AS DETERMINED FROM LOCAL METEOROLOGICAL DATA EXCEEDS THE SNOW LOAD LISTED ON THESE PLANS. 14. STRAPPING MUST BE TESTED AND/OR CERTIFIED TO VERIFY THE STRUCTURAL CAPACITY. APPROPRIATE DOCUMENTATION MUST BE ON FILE AT THE MODULAR BUILDING FACTORY.

15. ALL INTERIOR WALL AND CEILING FINISH MATERIALS SHALL BE CLASS A RATED IN ACCORDANCE WITH ASTM E 84 OR UL 723. WHERE CARPET IS USED FOR INTERIOR FLOOR COVERING IT SHALL BE OF CLASS I OR II MATERIALS IN ACCORDANCE WITH NFPA 253 AND SHALL COMPLY WITH THE DOOFF-1 "PILL TEST" (CPSC 16 CPF, PART 1-22).

16. ALL DIMENSIONS SHOWN ON FLOOR PLAN ARE TO THE EDGE OF FRAMING MEMBERS UNLESS OTHERWISE SPECIFIED. WHERE "CLEAR" IS SPECIFIED THE DIMENSION IS TO THE FINISHED SURFACE. DIMENSIONS ARE TO THE CLOSEST EDGE OF ALL NON-WALL ELEMENTS SUCH AS COUNTERS AND FIXTURES. DIMENSIONS ARE TO THE FINISHED SURFACE OF PERFARENCENT DESTROY DESTROY DESTROY. 17. THIS BUILDING IS NOT DESIGNED TO BE LOCATED IN A WIND BORNE DEBRIS REGION.

PLUMBING NOTES:

1. WHEN REQUIRED RESTROOM FACILITIES ARE NOT PROVIDED WITHIN THE BUILDING THEY SHALL BE LOCATED IN AN ADJACENT BUILDING OR SITE INSTALLED AND ARE SUBJECT TO THE APPROVAL AND INSPECTION BY THE JURISDICTION HAVING AUTHORITY. ALL SITE INSTALLED FACILITIES ARE DESIGNED BY OTHERS. THIS SHALL BE NOTED ON THE BUILDING DATA PLATE.

2. BUILDING OWNER ASSUMES ALL RESPONSIBILITY FOR DRINKING WATER FACILITIES, SERVICE SINK AND ALL OTHER REQUIRED PLUMBING FACILITIES NOT SHOWN ON FLOOR PLAN. ALL BUILDING OWNER PROVIDED FACILITIES ARE DESIGNED BY OTHERS. 3. TOILETS SHALL BE ELONGATED WITH NONABSORBENT OPEN FRONT SEATS.

4. RESTROOM WALLS SHALL BE COVERED WITH NONABSORBENT MATERIAL TO A MINIMUM HEIGHT OF 48 INCHES A.F.F. (72 INCHES MINIMUM ABOVE SHOWER DRAIN INLETS). TOLET, BATHING AND SHOWER ROOM FLOORS SHALL HAVE A SMOOTH, HARD, NONABSORBENT SURFACE THAT EXTENDS UPWARD ONTO THE WALLS AT LEAST 4 INCHES. 5. FULL-OPEN VALVE SHALL BE INSTALLED ON THE WATER DISTRIBUTION SUPPLY PIPE AT THE ENTRANCE INTO THE STRUCTURE AND ON THE DISCHARGE SIDE OF THE WATER METER. FULL-OPEN VALVE(S) SHALL BE SITE INSTALLED WHEN NOT FACTORY INSTALLED. ALL PLUMBING FIXTURES SHALL HAVE SEPARATE SHUTOFF VALVES. 6. WATER HEATER SHALL HAVE A T & P RELIEF VALVE INDIRECTLY CONNECTED TO A DRAIN LINE THAT TERMINATES IN ACCORDANCE WITH APPLICABLE PLUMBING CODE, AND A FULL-OPEN VALVE WITHIN 3 FEET ON THE COLD WATER SUPPLY LINE.

7. DWV SYSTEM SHALL BE PVC - DWV 8. WATER SUPPLY LINES SHALL BE TYPE "L" COPPER

ALL PIPE HANGERS SHALL BE NON-METALLIC OR OF THE SAME METAL AS THE PIPE BEING SUPPORTED. ALL SUPPORTS FOR PLASTIC PIPES SHALL PERMIT FREE
MOVEMENT AND/OR THERMAL EXPANSION OF THE PIPE. PIPING SUPPORTS SHALL BE SPACED IN ACCORDANCE WITH THE APPLICABLE PLUMBING CODE AND MANUFACTURER'S
MISTALLATION INSTRUCTIONS.

10. WATER PIPES INSTALLED IN A WALL EXPOSED TO THE EXTEROR SHALL BE LOCATED ON THE HEATED SIDE OF THE WALL INSULATION. WATER, SOIL & WASTE PIPES SHILL NOT BE INSTALLED ON THE HEATED SIDE OF THE BULLOW, IN A TIDES OF CONNESSINGEN, OWNERSHEED, OWNERSHEED IN OUTSIDE WALLS, OR MAY OBER PLACE SUBJECTED OF METERSHEED OF THE BULLOWS DEVELOPED, SUCH AS IN THE CAMESPACE, IS STEIN STALLED AND DESCRIBED OF OTHERS, BOTH IN SIGNATOR AND OWNERS, THE CONNESSINGEN SIZE OF THE BULLOWS DEVELOPED, SUCH AS IN THE CAMESPACE, IS STEIN STALLED AND DESCRIBE OF OTHERS, BOTH IN SIGNATOR AND OWNERS, THE CAMESPACE, IS STEIN STALLED AND DESCRIBE OF OTHERS, BOTH IN SIGNATOR AND OWNERS.

12. BUILDING DRAIN AND CLEANOUTS ARE DESIGNED AND SITE INSTALLED BY OTHERS, SUBJECT TO LOCAL JURISDICTION APPROVAL 13. THERMAL EXPANSION DEVICE, IF REQUIRED BY WATER HEATER INSTALLED, AND IF NOT SHOWN ON PLUMBING PLAN, IS DESIGNED AND SITE INSTALLED BY OTHERS, SUBJECT TO LOCAL APPROVAL.

14. STORAGE TANK-TYPE WATER HEATERS AND HOT WATER STORAGE TANKS THAT HAVE VERTICAL WATER PIPES CONNECTION TO THE INLET AND OUTLET OF THE TANK SHALL BE PROVIDED WITH INTERPAL HEAT TRAPS AT THOSE WILETS AND OUTLETS OR SHALL HAVE PIPE-CONTIGURED HEAT TRAPS IN THE PIPING CONNECTED TO THOSE NUTS AND OUTLETS. WATER HEATING EQUIPMENT SHALL BE PROVIDED WITH CONTROLS THAT ALLOW A SEPONT OF 90°F.

15. PPING FROM A WATER HEATER TO THE TERMINATION OF THE HEATED WATER FIXTURE SUPPLY PPE SHALL BE INSULATED IN ACCORDANCE THE 2015 ECC TABLE CAGO.210. ON BOTH THE INLET AND JUTLET PIPMS OF A STORAGE WATER HEATER OR HEATED WATER STORAGE TAME, THE PIPMS OF A HEATTH THE OF PIPMS, WHICHEVER IS LESS, SHALL BE RISULATED. USE I INCH THAN INSULATION FOR PIPC DAMETERS OF LESS THAN 1-1/2 INCH AND 1-1/2 INCH THICK INSULATION FOR PIPC DAMETERS OF LESS THAN 1-1/2 INCH AND 1-1/2 INCH THICK INSULATION FOR PIPC DAMETERS OF LESS THAN 1-1/2 INCH AND 1-1/2 INCH THICK INSULATION FOR PIPM DAMETERS OF LESS THAN 1-1/2 INCH AND 1-1/2 INCH THICK INSULATION FOR PIPM DAMETERS OF LESS THAN 1-1/2 INCH THE VIEW THAN 1-1/2 FOR THE VIEW THAN 1-

16. A WATER-HAMMER ARRESTOR SHALL BE INSTALLED WHERE QUICK-CLOSING VALVES ARE UTILIZED, UNLESS OTHERWISE APPROVED. WATER-HAMMER ARRESTORS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATIONS. WATER-HAMMER ARRESTORS SHALL CONFORM TO ASSE 1010. 17. TEMPERED WATER SHALL BE DELIVERED FROM LAVATORIES IN PUBLIC TOILET FACILITIES. TEMPERED WATER SHALL BE DELIVERED THROUGH AN APPROVED WATER-TEMPERATURE LIMITING DEVICE THAT CONFORMS TO ASSE 1070 AND SHALL LIMIT THE TEMPERED WATER TO A MAXIMUM OF 110F (43°C).

18. WHERE WATER PRESSURE TO THE BUILDING EXCEEDS 75 PSI STATIC, AN APPROVED WATER-PRESSURE REDUCING VALVE CONFORMING TO ASSE 1003 OR CSA B356 WITH STRAINER SHALL BE INSTALLED TO REDUCE THE PRESSURE IN THE BUILDING WATER DISTRIBUTION PIPING TO NOT GREATER THAN 75 PSI STATIC. ALL WATER PRESSURE REDUCING VALVES SHALL BE STIE INSTALLED AND DESIGNED BY OTHERS.

19. IF THE DEVELOPED LENGTH OF HOT OR TEMPERED WATER PIPING FROM THE WATER HEATER TO THE FIXTURES THAT REQUIRE HOT OR TEMPERED WATER EXCEEDS SC FEET THEN HEAT—TRACED PIPING SHALL BE PROVIDED IN ACCORDANCE WITH LEES SIST, AND THE PROLICABLE PULLWBING AND DERROY CODES, ALL HEAT—TRACE AND RELATED ACCESSORES SHALL BE DESIGNED BY OTHERS AND STE INSTALL BE 9Y OTHERS AND APPROVIDE BY THE AUTHORITY HAVING JURISDICTION. 20. PARTITIONS SEPARATING WATER CLOSETS IN MULTI-STATION RESTROOMS SHALL PROVIDE AT LEAST 12 INCHES OF CLEARANCE FROM THE FLOOR AND CEILING FOR AIR CIRCLE ATOM

22. ANY URINAL EQUIPPED WITH AN INTEGRAL TRAP SHALL NOT BE CONNECTED TO A PLUMBING DRAIN P-TRAP (DO NOT DOUBLE TRAP FIXTURE).

23. SHOWERS SHALL BE CONTROLLED BY AN APPROVED TEMPERATURE ACTUATED MIXING VALVE WITH A MAXIMUM WATER OUTLET TEMPERATURE OF 120F (43°C) TEMPERATURE ACTUATED MIXING VALVES SHALL COMPLY WITH THE REQUIREMENTS OF ASSE 1016 AND 1017. 24. SHOWER FLOORS OR RECEPTORS SHALL BE CONSTRUCTED OF IMPERVIOUS, NON-CORROSIVE, NON-ABSORBENT AND WATERPROOF MATERIALS

FLECTRICAL NOTES:

1. ALL EQUIPMENT SHALL BE LISTED BY UL FOR THE APPLICATION FOR WHICH IT IS USED AND ALL EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH THE LISTING. 2. THE SERVICE DISCONNECTING MEANS, MAIN ELECTRICAL PANEL, SURGE-PROTECTIVE DEVICES, FEEDERS TO ALL PANELS, AND GROUNDING AND BONDING SYSTEMS ARE DESIGNED BY OTHERS, SITE INSTALLED AND SUBJECT TO LOCAL JURISDICTION APPROVAL.

3. PRIOR TO BREGORD THE ELECTRICAL SYSTEM THE LOCAL ELECTRICAL CONSTITUTE DISEASE, MUST ESSICH AND VERBYT THAT THE HITBRUSTHIS CHAIRLY OF THE MAN BREWLER IS IN COMPAUNCE WITH SECTION VISIO OF THE SEC AND THAT THE SHORT—DISEASE DESIRED TRAINING OF THE MAN SERVICE COMPANIEST IS IN COMPANIEST SECTION 10.10 OF THE NICE. THE LOCAL ENGINEE IS RESPONSIBLE FOR DETAILING ELECTRICAL RISER DIAGRAM, SHORT CROUIT VALUES, VOLTAGE BOOP CALCULATIONS, FAULT CURRENT LO-ARBILTY REQUIREMENTS AND REQUIRED SINCE PROTECTION DEVICES.

4. THE LOCAL ELECTRICAL CONSULTING ENGINEER MUST VERIFY THAT THE INTERRUPTING RATING OF ALL FACTORY INSTALLED BREAKERS ARE IN COMPLIANCE WITH SECTION 10.9 OF THE INC. AND THAT THE SHORT-ORGUIT CURRENT RATING OF ALL ELECTRICAL COMPLIENT IS IN COMPLIANCE WITH SECTION 110.10 OF THE NEC. ANY MORPHATIONS ARE THE SHORT OF THE PROPERTY OF THE PROPERTY

6. ELECTRICAL PANELS SHALL BE EQUIPPED WITH A MAIN BREAKER OF THE SAME SIZE AS THE PANEL UNLESS OTHERWISE SPECIFIED.

7. OVERCURRENT DEVICES (CIRCUIT BREAKERS) SHALL BE READILY ACCESSIBLE AND INSTALLED SO THAT THE CENTER OF THE GRIP OF THE OPERATING HANDLE, WHEN IN THE HIGHEST POSITION, IS NOT MORE THAN 6'-7" ABOVE THE STANDING SURFACE ADJACENT TO THE DEVICE LOCATION.

10. ALL WATER HEATERS SHALL BE PROVIDED WITH READILY ACCESSIBLE DISCONNECTS ADJACENT TO THE WATER HEATERS SERVED. THE BRANCH CIRCUIT SWITCH OR CIRCUIT BREAKER SHALL BE PERMITTED TO SERVE AS THE DISCONNECTING MEANS ONLY WHERE THE SWITCH OR CIRCUIT BREAKER IS WITHIN SIGHT FROM THE WATER HEATER OR IS CAPABLE OF BEING LOCKED IN THE OPEN POSITION.

12. WHEN A SINGLE RECEPTACLE IS INSTALLED ON AN INDIVIDUAL BRANCH CIRCUIT THE RECEPTACLE SHALL HAVE AN AMPERE RATING NOT LESS THAN THAT OF THE BRANCH

14. DEPRENCY LIGHTING SHALL BE CAPABLE OF PROVIDING BITTAL LLUMINATION THAT IS AT LEAST AN AVERAGE OF 1 FOOT-CHOILE (15) AND A MINIMAN OF 0.1 for 10 for 10

15. EXCEPT FOR AREAS DESIGNATED AS SECURITY OR EMERGENCY AREAS THAT NEED TO BE CONTINUOUSLY LIGHTED AND EMERGENCY LIGHTING THAT IS NORMALLY OFF, INTERIOR LIGHTING SHALL BE CONTINUED BY COULFAIT SENSORS THAT TURN OFF THE LIGHTS WITHIN 30 HINUTES OF ALL OCCUPANTS LEAVING THE SANGE, AND SHALL WITHIN SHALL BE CONTINUED AND THE SANGE AND SHALL BE ADMITTED TO ALLOW OCCUPANTS TO THAT LIGHT OFF EMERGENCY CONTROLS SHALL BE FERMITED TO COULFOR LIGHTING IN PROJECT CORRESPONDED. SHALL BEFERVITED TO EXCLUSIVE OFF EMERGENCY COLOR SHALL BUTCHING IN SHALL BEFERVITED TO GOOD OFF EMERGENCY CONTROLS SHALL BE FERMITED TO COLOR CHIEF OF THE SAFETY OR SCURITY OF THE GOOD OFF BUTCHING COLOR SHALL BE ADMITTED TO THE ORDER OFF EMERGENCY COLOR SHALL BE ADMITTED TO THE OFF THE SAFETY OR SCURITY OF THE GOOD OFF BUTCHING COLOR SHALL BE ADMITTED.

- 18. ALL CIRCUITS POWERING UNSWITCHED LIGHTS SHALL BE PROTECTED BY "SWD" TYPE BREAKERS.
- 19. ALL CIRCUITS CROSSING OVER MODULE MATING LINE(S) SHALL BE SITE CONNECTED WITH APPROVED ACCESSIBLE JUNCTION BOXES OR CABLE CONNECTORS.

20. FIRE ALARM PULL STATION OPERABLE DEVICE SHALL BE LOCATED 42 TO 48 INCHES ABOVE FINISHED FLOOR. TOP OF FIRE ALARM HORN DEVICE SHALL BE LOCATED 90 INCHES INMINIUM ABOVE FINISHED FLOOR AND 6 INCHES MINIOUM BELOW CEILING, WHERE CEILING HEIGHT PERMITS. BOTTOM OF STROBE DEVICE SHALL BE LOCATED 80 INCHES MINIOUM ADD 96 INCHES MINIOUM ABOVE FINISHED FLOOR.

5. ALL CIRCUITS AND EQUIPMENT SHALL BE GROUNDED IN ACCORDANCE WITH THE APPROPRIATE ARTICLES OF THE NATIONAL ELECTRICAL CODE (NEC). ALL EQUIPMENT SHALL BE LISTED AND IDENTIFIED FOR USE WITH 75°C OR 90°C CONDUCTORS UNLESS OTHERWISE SPECIFIED.

8. THE FRONT SIDE OF ALL ELECTRICAL PANELS SHALL BE PROVIDED WITH A MINIMUM CLEAR WORKING SPACE DEPTH OF 36 INCHES PERPENDICULAR TO THE FACE OF THE PANEL AND A MINIMUM CLEAR WORKING SPACE WIDTH EQUAL TO THE PANEL WIDTH OR 30 INCHES, WHICHEVER IS GREATER, PARALLEL TO THE FACE OF THE PANEL. THE CLEAR WORKING SPACE SHALL NOT BE USED FOR STORAGE.

9. HVAC EQUIPMENT SHALL BE PROVIDED WITH READLY ACCESSIBLE DISCONNECTS ADJACENT TO THE EQUIPMENT SERVED. A UNIT SWITCH WITH A MARKED "OFF" POSITION THAT IS A PART OF THE HVAC EQUIPMENT AND DISCONNECTS ALL UNGROUNDED CONDUCTORS SHALL BE PERMITTED AS THE DISCONNECTING MEANS WHERE OTHER DISCONNECTING MEANS WHERE OTHER DISCONNECTING MEANS WHERE OTHER DISCONNECTION OF THE DISCONNECTING MEANS WHERE OTHER DISCONNECTION OF THE DISCON

11. ALL RECEPTACLES INSTALLED IN WET LOCATIONS (EXTERIOR) SHALL HAVE WEATHER PROOF (WP) ENCLOSURES, THE INTEGRITY OF WHICH IS NOT AFFECTED WHEN AN ATTACHMENT PLUG CAP IS INSERTED OR REMOVED. IN ADDITION NONLOCKING RECEPTACLES SHALL BE LISTED WEATHER-RESISTANT TYPE.

13. ALL EXTERIOR LIGHTS SHALL BE EQUIPPED WITH PHOTOCELLS FOR AUTOMATIC SHUT-OFF WHEN DAYLIGHT IS AVAILABLE.

16. IF REQUIRED OCCUPANT SENSORS FOR LIGHTING ARE NOT FACTORY INSTALLED THEN THEY SHALL BE SITE INSTALLED BY OTHERS AND SUBJECT TO THE APPROVAL OF THE JURISDICTION HAVING AUTHORITY.

17. WHEN LIGHT FIXTURES ARE INSTALLED IN CLOSETS THEY SHALL BE SURFACE MOUNTED OR RECESSED. INCANDESCENT AND LED LUMINAIRE FIXTURES SHALL HAVE COMPLETELY ENCLOSED LUMPS. SURFACE MOUNTED INCANDESSENT AND LED LUMINAIRE FIXTURES SHALL HAVE A MINIMUM CLEARANCE OF 12 INCHES AND ALL OTHER FIXTURES SHALL HAVE A MINIMUM CLEARANCE OF 10 INCHES FROM "STORES FROM" STORES AREA" AS DEFINED BY IVEC 4102.

LOOR LIVE LOAD: . 100 PSF VESTIBLE(S), CORRIDOR(S), KITCHEN & DINING ROOM, 50 SF ELSEWHERE.

FLOOD LOAD: THIS BUILDING IS NOT DESIGNED TO BE LOCATED IN A FLOOD

# NEW YORK STRUCTURAL LOAD LIMITATIONS: DESIGN CODE: ASCE 7-10 RISK CATEGORY: II A. 100 PSF VESTIBLE(S), CURNIDON (3), MILLIAN PSF ELSEWHERE B. 2000# CONCENTRATED LOAD OVER 30 INCH X 30 INCH AREA LOCATED ANYWHERE ON FLOOR. ROOF LIVE LOAD: A. 20 PSF. Th. SAC. 7-10 MODE EMPOSINE: FULL ON PARTIAL WIND LOAD: A. ULTIMATE WIND SPEED (3-SEC GUST): Void = 90 MPH NOMANAL WIND SPEED (3-SEC GUST): Void = 90 MPH D. NITHERNAL PRESSURE COEFFICIENT: Copi = 0.18 C. COMPORTIAL CALADOING PRESSURES (ROOF of 70 FEG.): WALL ZONE 5: Pult = 4/-36.6 FSF (Poid = 4/-23.2 FSF) ROOF ZONE 3: Pult = 72.7 FF (Poid = 4-36.2 FSF) ROOF ZONE 3: Pult = 72.8 FF (Poid = 4-30.9 FSF) ROOF ZONE 5: Pult = 48.3 PSF (Poid = 4-30.9 FSF) ROOF ZONE 5: Pult = 72.8 FSF (Poid = 4-30.1 FSF) UPPER HAF OF A HILL OR ESCARPHINI EXCEDING 15 FEET IN HEIGHT. BUILDING DESIGN IS BASED ON "ENCLOSED" CLASSIFICATION BUILDING MEAN ROOF HEIGHT SHALL NOT EXCEED 15 FEET. F. BOLLINO MEAN ROOF FEIGHT SMALL NOT EACED TO TEEL SESSING LOAD A SESSING MEMORY FAITOR IS 1.0 A SESSING MEMORY FAITOR IS 1.0 C SPECTRAL REPOSE COEFFICIENTS: Sa = 0.277 Sf = 0.067 D. SESSING DESCO. ACTEORY IS 1.1 D. SESSING DESCO. ACTEORY IS 1.1 E. SESSING FORCE RESSING SYSTEM IS AT 3. E. SESSING FORCE RESSING SYSTEM AND STATEMENT AND SEEN USED. C. RESPONSE OFFICIAL TO CR = 6.5. H. SESSING FERONSE COEFFICIENT Cs = N/A. 1. DESIGN AGES FERM V = 7.3 KE N/A.

#### BUILDING DATA NOTES:

1. CONSTRUCTION IS TYPE V-B. (5,995 GROSS SQUARE FEET).

3. MEANS OF EGRESS IS DESIGNED FOR AN OCCUPANT LOAD OF 1 PERSON PER 20 SQUARE FEET OF NET CLASSROOM FLOOR AREA, 1 PERSON PER 15 SQUARE FEET OF RIT DINING ROOM FLOOR AREA, 1 PERSON PER 100 SQUARE FEET OF GROSS OFFICE FLOOR AREA AND 1 PERSON PER 200 SQUARE FEET OF GROSS INCIDENT AREA.

4. FIRE RATING OF EXTERIOR WALLS IS 0 HOURS

THIS BUILDING REQUIRES A FIRE SEPARATION DISTANCE OF 10 FEET OF MORE IN ACCORDANCE WITH TAREE 602 AND SECTION 705.3 OF THE 80 AND IS SUBJECT TO LOCAL JURISDICTION APPROVAL. THIS STRUCTURE SHALL HAVE A MINIMAIM OF 807-07 CLEARANCE FROM NUMITIES AREA BUILDINGS.

7. THIS BUILDING CAN NOT BE INSTALLED IN NEW YORK CITY OR IN ANY OTHER LOCATION IN THE STATE OF NEW YORK WHERE DESIGN LOADS ARE NOT IN COMPULANCE.

#### SITE INSTALLED ITEMS:

NOTE THAT THIS LIST DOES NOT NECESSARILY LIMIT THE ITEMS OF WORK AND MATERIALS THAT MAY BE REQUIRED FOR A COMPLETE INSTALLATION. ALL SITE RELATED ITEMS ARE SUBJECT TO LOCAL JURISDICTION APPROVAL.

- 1. THE COMPLETE FOLINDATION SUPPORT AND THE DOWN SYSTEM RAMPS, STAIRS AND GENERAL ACCESS TO THE BUILDING.
- 3. PORTABLE FIRE EXTINGUISHER(S).

4. SUB-FLOOR SANITARY DRAINAGE SYSTEM, BUILDING DRAINS, CLEANOUTS, AND HOOK-UP TO THE PLUMBING SYSTEM. FREEZE PROTECTION OF ALL WATER, SOIL AND WASTE PIPES LOCATED OUTSIDE OF THE BUILDING THERMAL ENVELOPE.

- ELECTRICAL SERVICE HOOK-UP (INCLUDING FEEDERS) TO THE BUILDING
- 6. THE SERVICE DISCONNECTING MEANS, MAIN ELECTRICAL PANEL, FEEDERS TO ALL PANELS, AND GROUNDING AND BONDING SYSTEMS.
- 8. REQUIRED OCCUPANT SENSORS THAT ARE NOT FACTORY INSTALLED.
- 9. ALL METAL FRAMING MEMBERS SHALL BE BONDED TO THE BUILDINGS ELECTRICAL SYSTEM. THE BUILDING OWNER IS RESPONSIBLE FOR RETAINING APPROPRIATELY QUALIFIED AND LICENSED ENTITIES TO DESIGN AND INSTALL REQUIRED BONDING.
- 10. DUAL ELEMENT EXTERIOR EXIT DISCHARGE LIGHTING WHEN NOT SHOWN ON PLANS.
- 12. GUTTERS & DOWN SPOUTS WHEN REQUIRED. 13. WATER-PRESSURE REDUCING VALVE, WATER-HAMMER ARRESTOR(S), AND WATER HEATER THERMAL EXPANSION DEVICE(S) WHEN RECUIRED.
- 14. PROGRAMMABLE THERMOSTATS IF NOT INSTALLED AT FACTORY.
- 15. DRINKING FOUNTAIN & SERVICE SINK WHEN NOT SHOWN ON FLOOR PLAN.
- 16. HEAT-TRACE FOR HOT OR TEMPERED WATER PIPING WHERE REQUIRED.
- 17. ALL SIGNS, INCLUDING TACTILE SIGNS, UNLESS OTHERWISE SPECIFIED.
- 18. CONNECTIONS OF ELECTRICAL CIRCUITS CROSSING OVER MODULE MATING LINE(S) (MULTI-UNITS ONLY). 19. STRUCTURAL AND AESTHETIC INTERCONNECTIONS BETWEEN MODULES (MULTI-UNITS ONLY).

20. ANY AIR GAPS BETWEEN MODULES AT FLOOR AND CEILING LINES AND ANY OTHER PENETRATIONS THROUGH THE BUILDING ENVELOPE SHALL BE CAULKED, GASKETED, WEATHER-STRIPPED, WRAPPED OR OTHERWISE SEALED TO LIMIT UNCONTROLLED AIR MOVEMENT.

- 21. RODENT PROOFING IN ACCORDANCE WITH IBC APPENDIX F SHALL BE INSTALLED ON ALL BUILDINGS IN LOCATIONS WHERE THE JURISDICTION HAVING AUTHORITY HAS ADOPTED APPENDIX F. ROCENT PROOFING IS DESIGNED BY OTHERS, SITE INSTALLED AND SUBJECT TO THE APPROVAL OF THE JURISDICTION HAVING AUTHORITY.
- 22. T-GRID CEILING WHEN NOT FACTORY INSTALLED.
- 23. MANUAL FIRE ALARM SIGNALING SYSTEM.
- 24 INTERIOR WALL FINISH (Le. TAPING AND MILIDDING OF ALL DRYWALL SEAMS, PRIMER AND PAINTING OF DRYWALL ect.)
- 25. ALL KITCHEN EQUIPMENT, APPLIANCES AND FURNISHING INCLUDING HOOD SYSTEMS, HOOD SYSTEM FIRE SUPPRESSION SYSTEM AND ITS CONNECTION TO THE FIRE ALARM SIGNALING SYSTEM, EXHAUST AND MAKE-UP AIR FAN AND ROOFTOP DOAS HVAC SYSTEM.
- 26. ROOF GUARDS FOR ROOF TOP EQUIPMENT 27. ALL GAS LINES.

#### FOUNDATION NOTE:

FOR FOUNDATION DESIGN REFER TO THE ATTACHED FOUNDATION PLANS PREPARED BY THE B DESIGNER. IF FOUNDATION PLANS ARE DESIGNED BY OTHERS, THE BUILDING DESIGNER SHALL HELD RESPONSIBLE OR LABLE FOR THE FOUNDATION DESIGN & THE CONSCIUNTIAL PERFORMANCE.



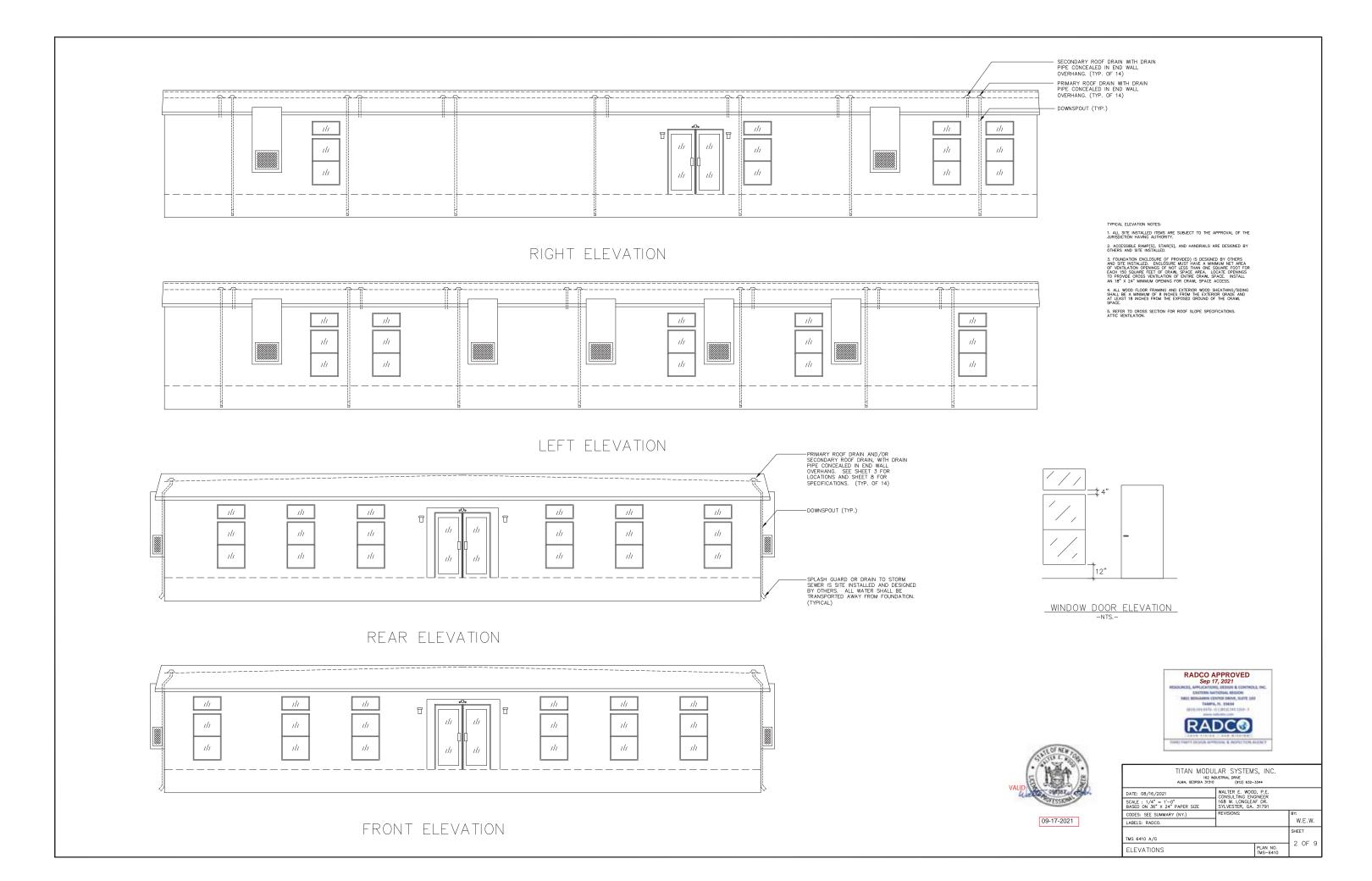
INDEX: SHEET DESCRIPTION COVER SHEET
ELEVATIONS
FLOOR PLAN
FLOOR PLAN
ELECTRICAL PLAN
ELECTRICAL PLAN
MECHANICAL PLAN
MECHANICAL PLAN
MEFLECTIVE CEILING PLAN
ONE HOUR NOTES & DETAILS
& STE INSTALLED HEADER DETAILS KIP LOAD FOUNDATION PLAN

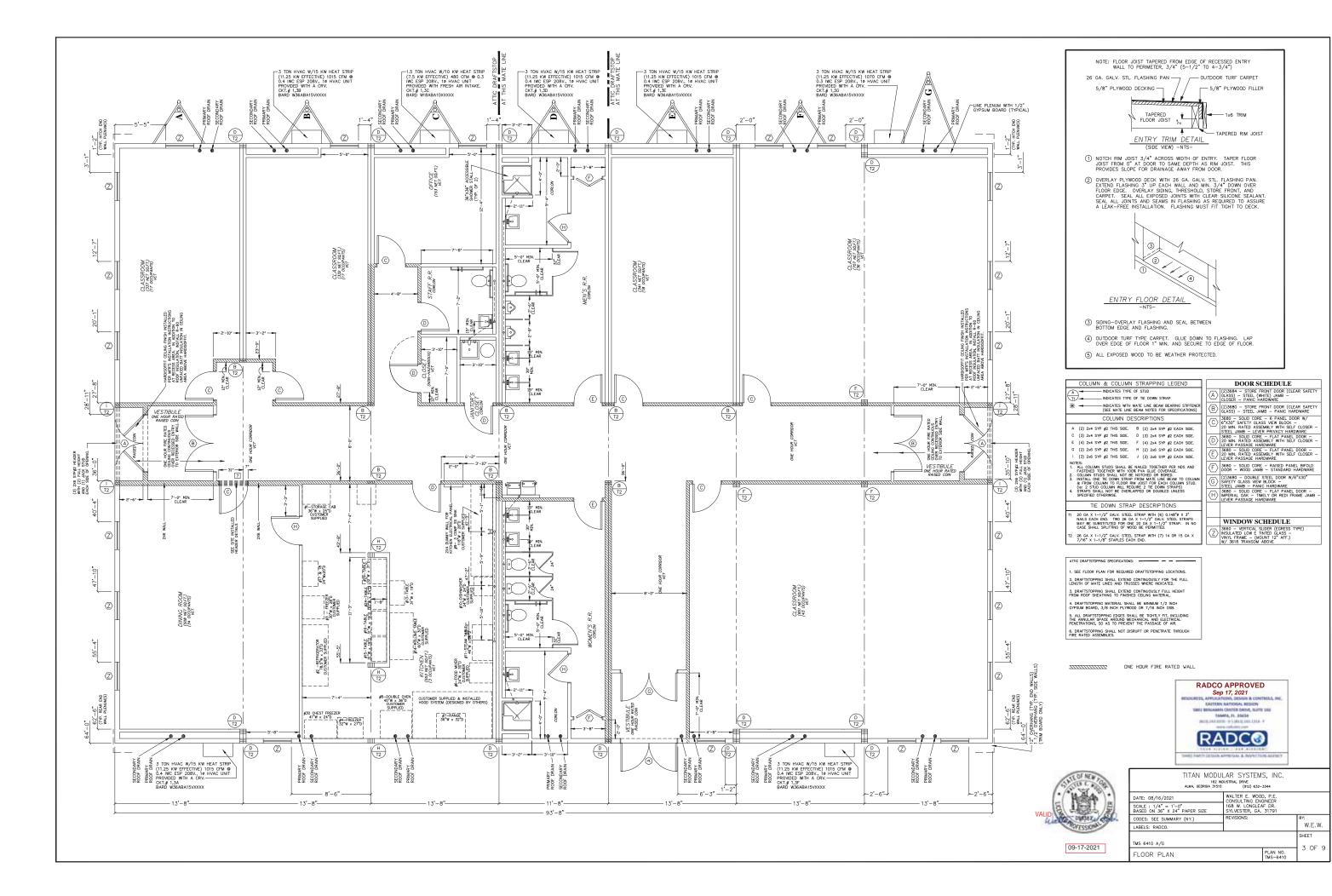
> TITAN MODULAR SYSTEMS INC. 162 INDUSTRIAL DRIVE ALMA, GEORGIA 31510 (912) 632-3344

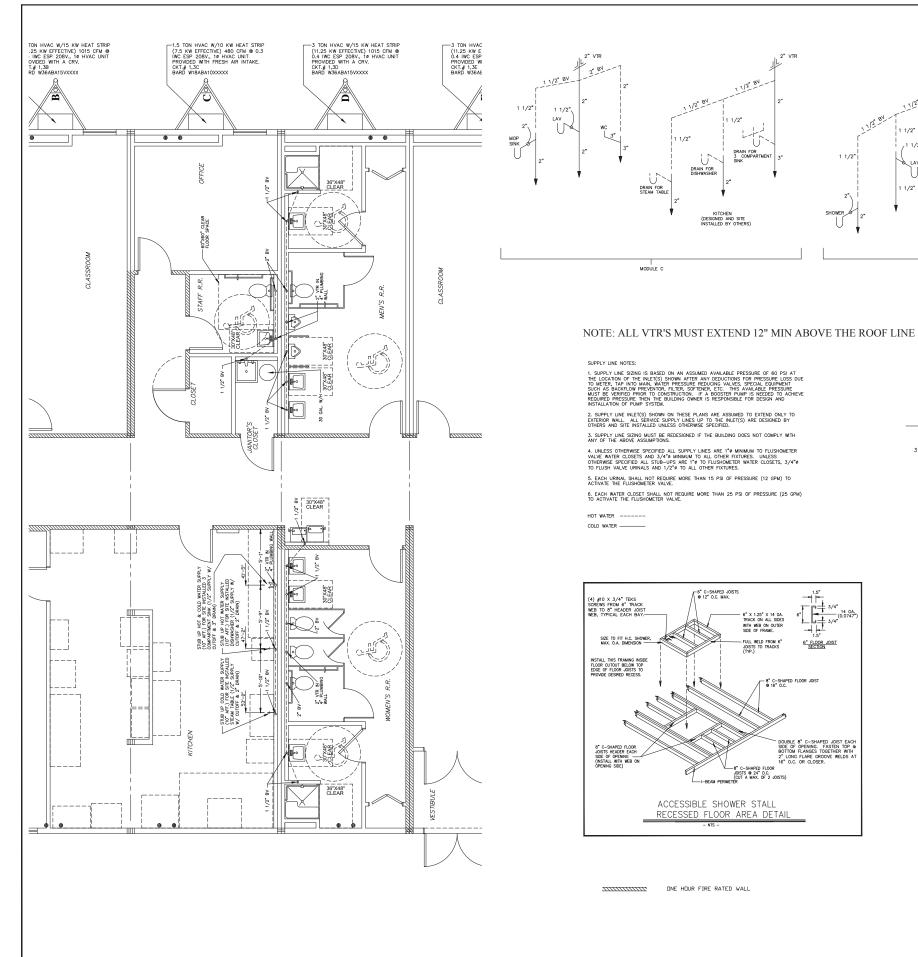
WALTER E. WOOD, P.E. CONSULTING ENGINEER 168 W. LONGLEAF DR. SYLVESTER, GA. 31791 DATE: 08/16/2021 SCALE : -NTS.-REVISIONS: CODES: SEE SUMMARY (NY.) W.E.W. LABELS: RADCO BUILDING DESTINATION: BLOOMING GROVE N TMS 6410 A/G OF COVER SHEET PLAN NO. TMS-6410

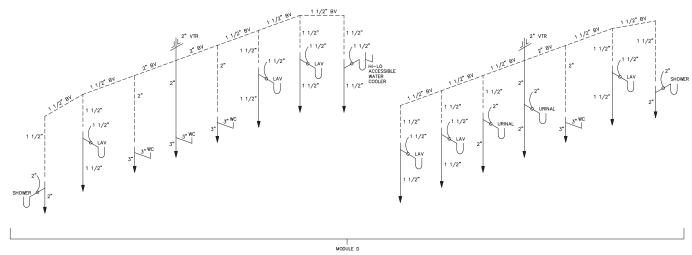


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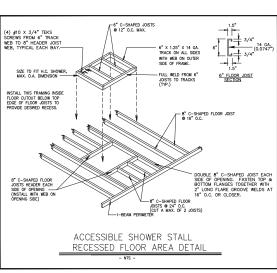


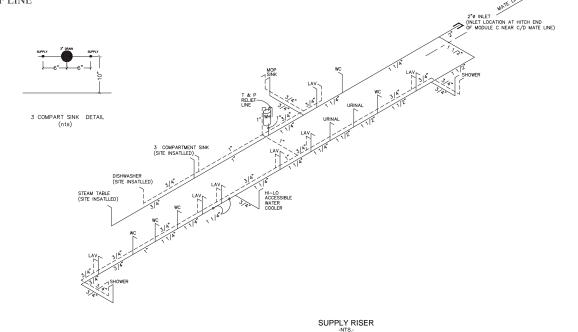






DWV RISERS



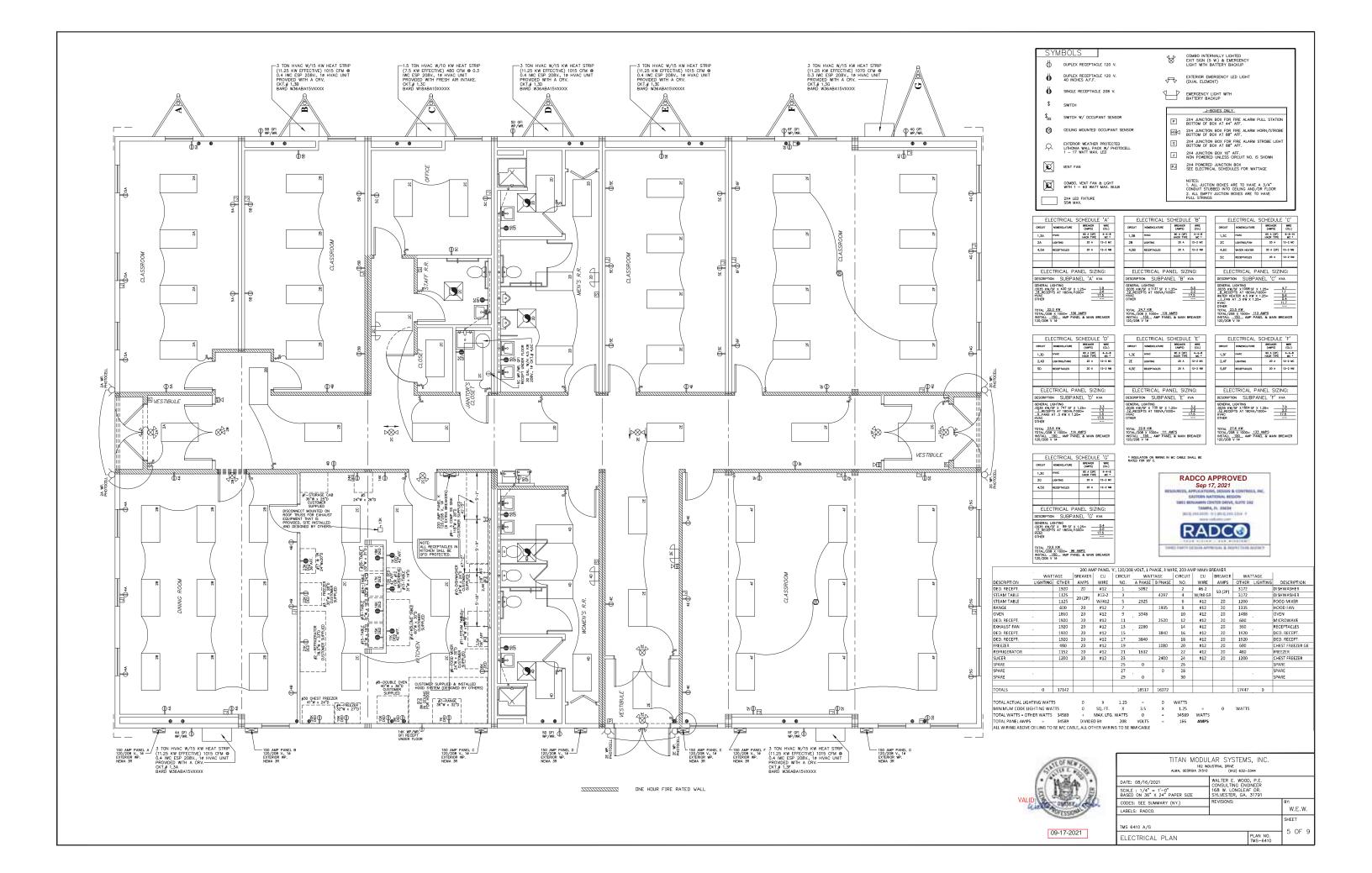


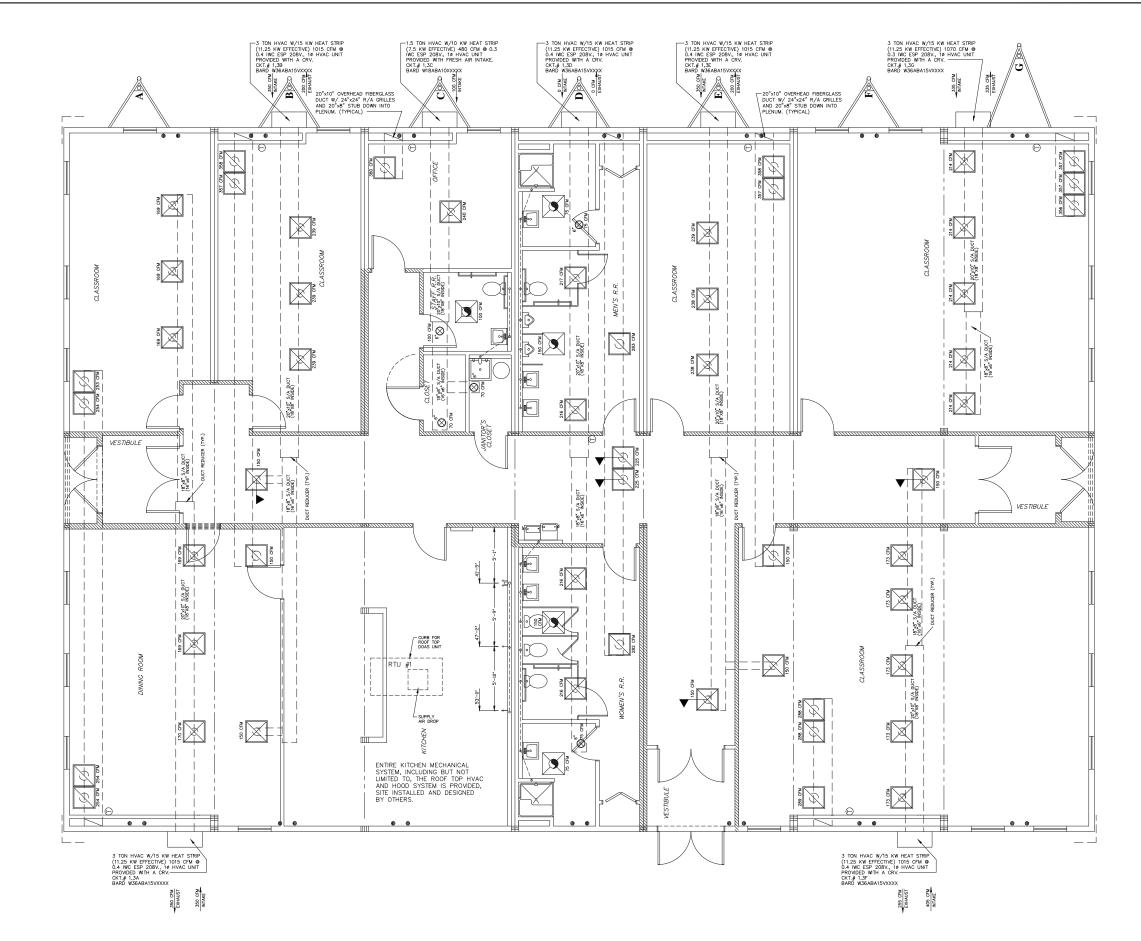


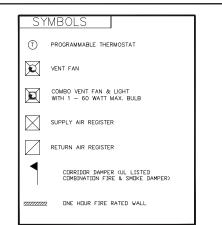
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TITAN MODULAR SYSTEMS, INC. 162 Noustrial drive a.ma. georgia 31510 (812) 632–3344							
DATE: 08/16/2021	WALTER E. WOOL						
SCALE : 1/4" = 1'-0" BASED ON 36" X 24" PAPER SIZE	168 W. LONGLEA SYLVESTER, GA.						
CODES: SEE SUMMARY (NY.)	REVISIONS:	BY:					
LABELS: RADCO.	W.E.W.						
			SHEET				
TMS 6410 A/G	4 05 0						
PLUMBING PLAN		PLAN NO. TMS-6410	4 OF 9				







#### NOTE:

SEE MECHANICAL NOTES FOR SUPPLY AND RETURN AIR DUCT AND REGISTER SPECIFICATIONS.





TITAN MODULAR SYSTEMS, INC.
162 INDUSTRIAL DRIVE
ALMA, GEORGIA 31510 (912) 632-3344

ALMA, GORGIA 3190

ALMA, GORGIA 3190

ALTE: 08/16/2021

SCALE: 1/4" = 1'-0"

BASED ON 36" X 24" PAPER SIZE

CODES: SEE SUMMARY (NY.)

LABELS: RADOO.

REVISIONS:

BY:

W.E.W.

SHEET

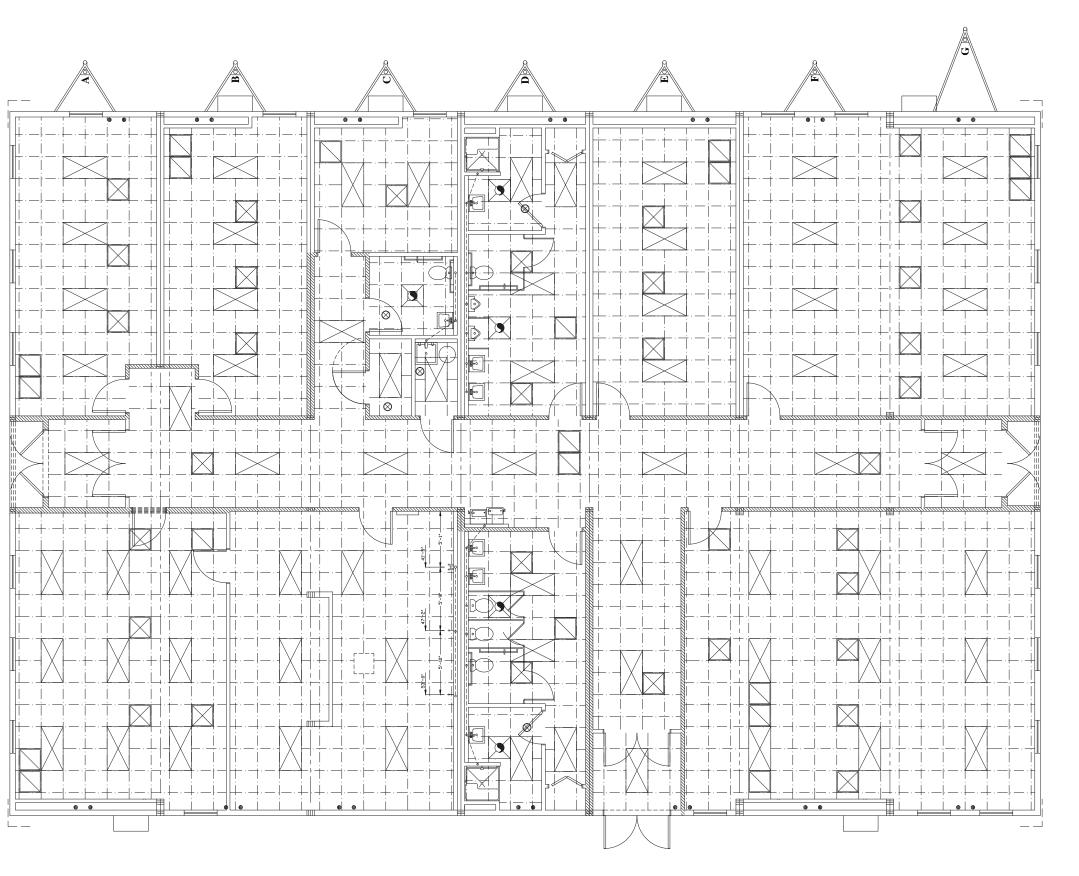
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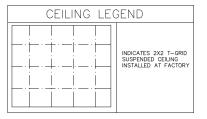
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MECHANICAL PLAN

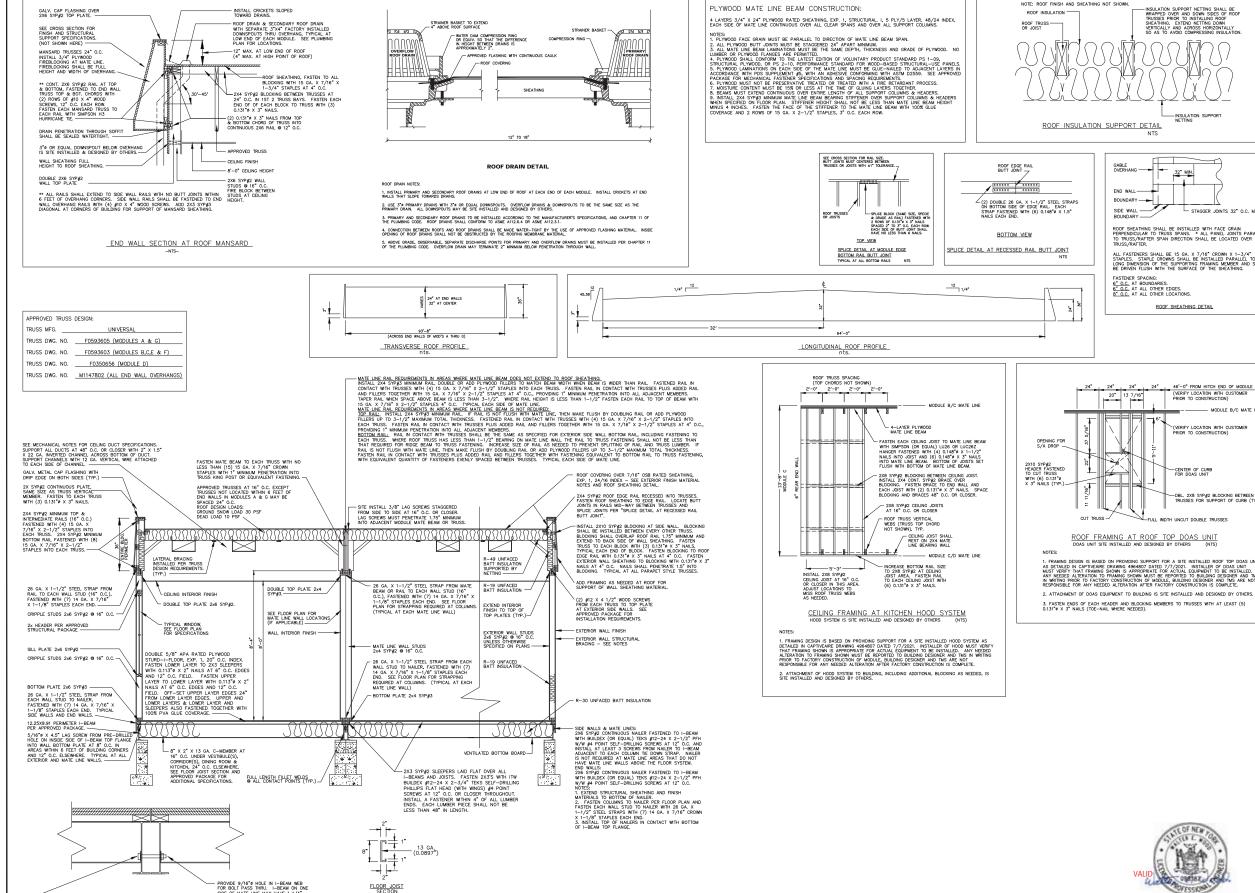






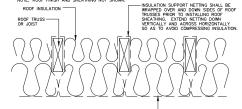


TITAN MODULAR SYSTEMS, INC. 162 INDUSTRIAL DRIVE ALMA, GEORGIA 31510 (912) 632-3344					
DATE: 08/16/2021					
SCALE : 1/4" = 1'-0" BASED ON 36" X 24" PAPER SIZE	CONSULTING ENGINEER 168 W. LONGLEAF DR. SYLVESTER, GA. 31791				
CODES: SEE SUMMARY (NY.)	REVISIONS:		BY:		
LABELS: RADCO.			W.E.W.		
			SHEET		
TMS 6410 A/G			7 OF 9		
REFLECTIVE CEILING PLAN		PLAN NO. TMS-6410	/ OF 9		



SITE INSTALLED 1/2\*# THREADED BOLTS (ASTM A325) WITH HEX NUT, LOCK WASHERS & FENDER WASHERS. WHERE SLOTTED HOLES ARE USED, WASHERS SHALL BE 1 3/4\* 1 3/4\* S./6\* THICK HARDENED STEEL AT LEAST 3 THREADS SHALL BE EXPOSED ABOVE NUTS. INSTALL BOLTS 2 FOOT FROM EACH END OF MODULE AND 8 O.C. MAX. IN BETWEEN.

MATE LINE FLOOR CONNECTION



BOUNDARY \_\_\_\_ SIDE WALL -

32" MIN. STAGGER JOINTS 32" O.C. MIN

(VERIFY LOCATION WITH CUSTOMER PRIOR TO CONSTRUCTION) -CENTER OF CURB FOR DOAS UNIT -DBL. 2X8 SYP#2 BLOCKING BETWEEN TRUSSES FOR SUPPORT OF CURB (TYP.)

ROOF FRAMING AT ROOF TOP DOAS UNIT DOAS UNIT SITE INSTALLED AND DESIGNED BY OTHERS (NTS)

1. FRAMINO DESIGN IS BASED ON PROVINING SUPPORT FOR A SITE INSTALLED ROOF FOR DOAS UNIT AS DETAILED NO PAPINEARE BRANNE GREATED HIS TO A SITE OF THE S

3. FASTEN ENDS OF EACH HEADER AND BLOCKING MEMBERS TO TRUSSES WITH AT LEAST (5) 0.131 9 X 3" NAILS (TOE-MAIL WHERE NEEDED).

ROOF SHEATHING SHALL BE INSTALLED WITH FACE GRAIN PERPENDICULAR TO TRUSS SPANS. \* ALL PANEL JOINTS PAR. TO TRUSS/RAFTER SPAN DIRECTION SHALL BE LOCATED OVER TRUSS/RAFTER. FASTENER SPACING:
6" O.C. AT BOUNDARIES.
6" O.C. AT ALL OTHER EDGES.
8" O.C. AT ALL OTHER LOCATIONS.

DID. MULLS, MID. SOF. WALLS.

BERANCE DISTALLATION:
STRUCTURAL SHEATHING SHALL EXTEND CONTINUOUS FROM TOP OF TRUSS TOP CHORD TO
STRUCTURAL SHEATHING SHALL EXTEND CROSS SUPPORTED BY 2" NOMINAL
LUMBER OF THE SAME SUZE MID OFFICE AS EXTERIOR WITH FRAMING, BRACKON MATERIAL
LUMBER OF THE SAME SUZE MID SPECIFIC ORDITLE PREPEDIDUCIAN TO THE SAME OF
THE WALL STUDIS UNLESS OTHERWISE SPECIFICE.

BRACING MATERIAL - HITCH END, REAR END & MODULE G SIDE WALL(S) 7/16" OSB RATED SHEATHING, EXP-1, FASTENED WITH 0.131" × 2-1/2" GALV. NAILS AT 6"

GENERAL CROSS SECTION NOTES:

GENERAL FINISH NOTE:

INTERIOR FINISH MATERIALS:

EXTERIOR FINISH MATERIALS:

EXTERIOR WALL STRUCTURAL BRACING:

I. UNLESS OTHERWISE SPECIFIED ALL STEEL SHALL COMPLY WITH ASTM A36, YIELD STRENGTH 36 KSI

STRENGTH 36 KSI.

2. ALL LAG SCREWS SHALL COMPLY WITH ANS/ASME B18.2.1. Fyb = 60 KSI MINIMUM.

3. SEE FOUNDATION PLAN FOR PIER AND TIE DOWN ANCHORAGE LOCATIONS, ORIENTATIONS MIND SPECIFICATIONS.

4. MHEERE 1" STAPLES ARE SPECIFIED THIS SHALL MEAN 1" PENETRATION INTO HOLDING

4. WHERE 1\* STAPLES ARE SPECIFIED THIS SHALL MEAN 1\* PENETRATION INTO HOLDING WILLIER.

MINISTRUCTURE OF THE STAPLES ARE SPECIFIED THIS SHALL MEAN 1\* PENETRATION INTO HOLDING WILLIES OF THE STAPLES AND 3.4" MINISTRUCTURE SHALL BE INSTALLED IN CENTER SHALL BE INSTALLED WITH THE COORN POSITIONED VERTICALLY. ALL STAPLE SHALL BE INSTALLED WITH THE COORN POSITIONED VERTICALLY. ALL STAPLE SHALL BE INSTALLED WITH THE COORN POSITIONED VERTICALLY. ALL STAPLE SHALL BE INSTALLED WITH THE COORN POSITIONED VERTICALLY. ALL STAPLE SHALL BE INSTALLED WITH THE COORN POSITIONED VERTICALLY. ALL STAPLE SHALL BE INSTALLED WITH THE COORN POSITIONED SHALL BE THE STAPLE WITH THE SHALL BE INSTALLED ON THE INTERIOR SIDE OF THE ASSEMBLUES UNLESS OTHERWISE SPECIFIED. THE VIPOL OF THE WITH THE SHALL BE INSTALLED ON THE INSTALLED IN COORDINATION SHALL BE TRIFTED AND SHALL BE T

9. SEE GENERAL NOTES ON COVER SHEET FOR INTERIOR PINSM MATERIAL PINSM RATING CLASSIFICATION.

CLASSIFICATION ENTERN MOVILES WHICH OCCUR PINSM SET-UP MINST BET FILLED WITH SOULD OSB OR PLYWOOD RATED SHEATHING. FILLER MATERIAL THICKNESS SHALL NOT ELECTED THE GAP MOTH AND SHALL NOT BE LESS THAN THE CAP WITH MINING 37/6 INCH. AT EACH CONNECTION LOCATION ACROSS MATE LIMES THE FILLER MATERIAL SHALL BE HORIZONTALLY AT LESS T 4 INCHES ON BOTH SIGN FIF FASTISHESS AND SHALL EXTEND HORIZONTALLY AT LESS T 4 INCHES ON BOTH SIGN FIF FASTISHESS AND SHALL EXTEND FOR EXCUREMENTS AND FOR REFERENCES ON BOTH SIGN SHALL PROVIDED STITLEY SHACKAGE.

GENERAL FINISH NUTE:

1. ALL ROOFING AND SDING MATERIALS SHALL BE INSTALLED IN ACCORDANCE WITH THE PRODUCTS MANUFACTURER'S INSTALLATION INSTRUCTIONS.

2. ROOFING AND SDING MATERIALS AND THEIR FASTERINGS SHALL BE DESIGNED TO RESIST 2. ROOFING AND SIGN AND THEIR FASTERINGS SHALL BE DESIGNED TO RESIST 3. ALL ROOF COVERINGS SHALL MEET CLASS C OR BETTER REQUIREMENTS.

3. ALL ROOF COVERINGS SHALL MEET CLASS C OR BETTER REQUIREMENTS.

4. WALL FINISH SHALL BE INSTALLED OVER APPROVED WEATHER-RESISTIVE BARRIER AND ASSESSIVE BARRIER AND APPROVED MATERIALS. BARRIER SHALL BE A MINIMUM OF ONE APPROVED MATERIALS. BARRIER SHALL BE A TRACKED TO SPECIAL SCALED DIRECTLY APPROVED MATERIALS. BARRIER SHALL BE A TRACKED TO SPECIAL SCALED BRECTLY OF THE PROPERTY O

CEILING — CLASS 'A' T—GRID CEILING INSTALLED PER MANUFACTURER'S SPECIFICATIONS. KITCHEN T—GRID TO BE VINIV. COVERED/WASHABLE T—GRID PANELS. NOTE — VESTBULE(S) & CORRIGOR(S) TO HAVE ONE HOUR RATING AS SHOWN ON PLANS. SEE ONE HOUR NOTES AND DETAILS ON SHEET 9 OF 9.

WALL — 5/8 INCH TYPE "X" UNFINISHED CYPSIAM BOARD THROUGHOUT, FINISH TO BE DESIGNED AND SITE INSTALLED BY OTHERS AND SUBJECT TO LOCAL APPROVAL, EXCEPT — FIBERGLASS REINFORCED PARELING FULL HEIGHT) MINIMAM CLASS "C" FINISH OVER 5/8 INCH TYPE "X" CYPSIAM BOARD IN KITCHEN, RESTROOM(S), SHOWER ROOM(S) & JUNTION'S CLOSE".

FLOOR - CORLON OR WINYL BLOCK TILE IN RESTROOMS AND OTHER WET AREAS; CARPET, CORLON OR VINYL BLOCK TILE INSTALLED IN ALL OTHER AREAS.

ROOF — MULE-HIDE 60 MIL EPDM, RECOGNIZED BY ICC ES ESR-1463, ADHERED TO 7/16\* 058 RATED SHEATHING USING MULE-HIDE FR ADHESVE, INSTALLED IN ACCORDANCE WITH INTERTEX CODE COMPLIANCE RESEARCH REPORT CORR-1078. THIS ASSEMBLY WILL PROVIDE A CLASS 'C' RICE CLASSIFICATION. THIS APPLICATION IS LIMITED TO ROOF SLOPES OF 1/4/12 MINIMUM TO 11:21 ANAXION T

1/4:12 MINIOUM TO 1:12 MAXIOUM.

HITCH END, BEAR END, & MODULE G. SIDE MALL(S). — 29 GA. GALV. STEEL (ASTM. A 653 G-90) CLASSIC RIB BY "METAL SALES MANUFACTURING CORP." INSTALLED MITH RIBS VERTICAL, FASTED THROUGH 7/16 INCH 098 AT 107 DAN BOTTOM PLATES AND AT WALL STUDS (16° O.C.) WITH 199-16 X 1-1/2′ LONG ATLAS WOODFAST HEX WASHER HEAD (TITIM) SCHEWS SPACED 9′ O.C. WITH (2) FASTEMER AT ALL SIGE LAW LOCATIONS. - HOROZOTHIA WEATHER-RESISTING BARRIER BETWEEN SIGNIC AND WALL SHEATHING. INSTALL MINIMUM 15/4 FIFE IN ASTM. 126. A VILLEY AND A STEEL WITH ASTM. 126. A STEEN FEIT WITH 86 X 1′ MINIMUM GALV. ANNULAR RING SHANK NAILS WITH ASTM. 126. A X 1-15/9 FOL. IN CARP SPACED 8′ O.C. DECIS AND 12′ O.C. RELD. NAILS WITH DEPOLITY AND A STEEL SHANK NAILS

JANITOR'S CLOSET:
NOTE - VESTIBULE(S) & CORRIDOR(S) TO HAVE ONE HOUR RATING AS SHOWN ON PLANS. SEE ONE HOUR NOTES AND DETAILS ON SHEET 9 OF 9.

7/16" OSB RATED SHEATHING, EXP-1, FASTENED WITH 0.131"® x 2-1/2" GALV. NAILS AT 6" O.C. EDGES AND 6" O.C. IN THE FIGURE ALL STREET SHEET SHEET

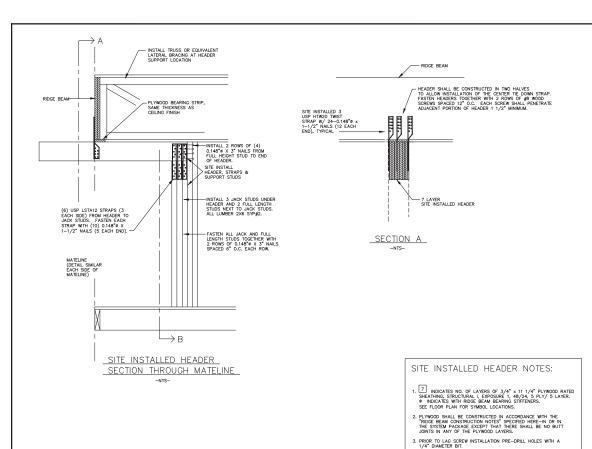
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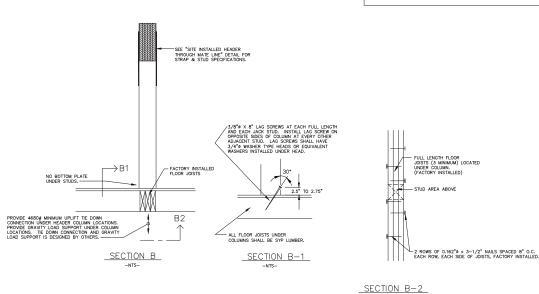


Sep 17, 2021 RESOURCES, APPLICATIONS, DESIGN & CONTROLS, INC. EASTERN NATIONAL REGION TAMPA, FL 33434 (#13) 243-0370- O L (#13) 243-1814- F **RADC®** 

TITAN MODUL 162 ing alma, georgia 31510	JUSTRIAL DRIVE			
DATE: 08/16/2021	WALTER E. WOOD, P.E. CONSULTING ENGINEER			
SCALE : -NTS	168 W. LONGLEAF DR. SYLVESTER, GA. 31791			
CODES: SEE SUMMARY (NY.)	REVISIONS:		BY:	
LABELS: RADCO.			W.E.W.	
			SHEET	
TMS 6410 A/G			8 OF 9	
CROSS SECTION		PLAN NO. TMS-6410	0 0 9	

09-17-2021





SITE INSTALLED HEADER DETAILS

#### FIRE RESISTANT ASSEMBLIES

WOOD STUD WALLS:

1 HOUR PER UL NO. U305 - 1 LAYER 5/8" TYPE "X" CYPSUM EACH SIDE OF WALL.

1 HOUR PER UL NO. U305 - 1 LAYER 5/8" TYPE "X" CYPSUM EACH SIDE OF WALL.

1 HOUR PER UL NO. U305 - 1 LAYER 5/8" TYPE "X" GYPSUM BOARD HAS A PREDECORATED OR

WIN'L COVERED FINISH AND FASTEN IT WITH 60 COATED NAILS, 1-7/8" LONG, 0,0915 SHANK, 1/4" HEADS, 7" O.C. AT JOINTS AND TOP AND

BOTTOM PLATES AND 3/8" BEAD OF ADHESIVE AT INTERMEDIATE STUDS. JOINTS STAGGERED 16" ON OPPOSITE SIDES OF WALL.

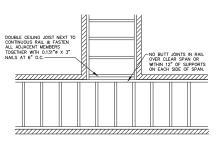
WOOD STUD MATE LINE WALLS:
1 HOUR PER UL NO. U341 — SEE ONE HOUR WALL DETAIL.

#### ASSEMBLIES CROSSING MODULE MATE LINES:

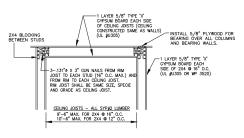
WALL AND CEILING ASSEMBLIES THAT CROSS OVER MODULE MATE LINES SHALL BE COMPLETED ON SITE IN ACCORDANCE WITH THE APPLICABLE ASSEMBLY USTING TO ACHIEVE THE REQUIRED FIRE RESISTANCE CONTINUOUSLY ACROSS THE MATE LINE. THIS MAY REQUIRE HOLDING BACK MATERIALS OR PORTIONS OF THE ASSEMBLY IN THE FACTORY TO FACILITATE PROPER COMPLETION ON SITE.

PENETRATION OF FIRE RESISTANT WALLS AND CEILING:

- WALL PENETRATION COMBUSTIBLE CABLES AND WIRES, COMBUSTIBLE PIPES, TUBES, AND CONDUIT SHALL MEET TESTING REQUIREMENTS
  OF ASTM ETIPS AS PART OF THE FIRE RESISTANT ASSEMBLY OR SHALL HAVE THROUGH-PENETRATION FIRESTOP SYSTEMS USIDE ON MOITESTED AS PER ASTM EST4 AND BE TESTED AS PRESISTED REFERENTIAL ESTWEEN THE EXPOSED MOI UNEXPOSED SURFACES
  OF NOT LESS THAN 0.01 INCH OF WATER AND HAVE AN 1 RATING OF AT LEAST 1 HOUR BUT NOT LESS THAN THE RATING OF THE
  ASSEMBLY.
- 2. WALL PENETRATION CABLES AND WRES WITHOUT COMBUSTBLE INSULATIONS AND NON COMBUSTBLE PIPES, TUBES, AND CONDUITS SHALL BE PROTECTED AS DESCRIBED ANDLY OF SHALL HAVE THE ANNULAR SPACE FILLED WITH A MATERIAL MEETING THE RECURREMENT OF ASTM E119 TESTED UNDER A MINIMUM POSITIVE PRESSURE DIFFERENTIAL OF 0.01 INCH OF WATER FOR A TIME PERIOD EQUIVALENT TO THE ASTRUME OF THE ASSEMBLE OF THE ASSEMBLE AND ASSEMBLE OF THE ASSEMBLE ASSEMBLE OF THE ASSEMBLE ASSEMBLE
- 3. ELECTRICAL BOXES SHALL BE METAL OR LISTED FOR USE IN FIRE RESISTANT ASSEMBLIES AND SHALL NOT EXCEED 16 SQUARE INCHES. BOXES ON OPPOSITE SIDES OF FIRE RESISTANT WALLS SHALL BE SEPARATED BY A MINIMUM HORIZONTAL DISTANCE OF 24 INCHES.
- 4. ALL CEILING FIXTURES SHALL BE SURFACE MOUNTED.
- 5. HORIZONTAL MEMBRANE PENETRATIONS COMBUSTIBLE CABLES AND WIRES, COMBUSTIBLE PIPES, TUBES, AND CONDUIT SHALL MEET TESTING REQUIREMENTS OF ASTM E119 AS PART OF THE FIRE RESISTANT ASSEMBLY OR SHALL HAVE THROUGH-PENETRATION PIRESTOP SYSTEMS LISTED AND TESTED AS PER ASTM. E814 OF OU. 1479 AND BE TESTED AT A POSTUYE PRESSURE DIFFERENTIAL BETWEN THE EXPOSED AND UNEXPOSED SURFACES OF NOT LESS THAN 0.01 INCH OF WATER AND HAVE AN F RATING/T RATING OF AT LEAST 1 HOUR BUT NOT LESS THAN THE ATTAINS OF THE ASSEMBLY.
- E HORIZONTAL MEMBRANE FEMERATIONS STEEL, FERRULS OR COPPER CONDUITS, PIESS, TUBES OR VENTS SYALL BE PROTICTED AS DESCRIBED IN ITEM 5. ARBOYCO RE SHALL HAVE THE ANNUARE SPACE PROTECTED WITH MATERIALS THAT PREVISE THE FASSAGE OF FLAME AND HOT GASES SUFFICIENT TO IGNITE COTTON WASTE WHEN SUBJECT TO ASTIN E 119 CR UL 263 TIME—TEMPERATURE FIRE CONDITIONS UNDER A MINIMUM POSTINE PRESSURE DIFFERENTIAL OF OLD INCH WATER AT THE LOCATION OF THE FEMERATURE FIRE CONDITIONS CONTINUED AND AND THE PREMEMBRANE FOR A THE PROPRIOD EQUIVALENT TO THE FIRE RESISTANCE RATING OF THE CONSTRUCTION PENETRATED. THE AGGREGATE AREA OF THE OPENINGS THROUGH THE MEMBRANE SHALL NOT EXCEED TO SOUGHE MORES OF CELLING AREA IN ASSEMBLIES ESTEED WITHOUT PERTATIONS.
- DUCTS THAT PENETRATE ONE HOUR FIRE RESISTANT CEILING ASSEMBLIES SHALL BE PROTECTED AT EACH PENETRATION WITH A LISTED FIRE DAMPER INSTALLED IN ACCORDANCE WITH ITS LISTING. FIRE DAMPERS SHALL COMPLY WITH THE REQUIREMENTS OF UL 555 AND SHALL BE LABELED FOR USE IN DYNAMIC SYSTEMS.
- DUCTS THAT PENETRATE ONE HOUR FIRE RESISTANT CORRIDOR PARTITIONS, INCLUDING CEILING ASSEMBLIES CONSTRUCTED AS FIRE RATED PARTITIONS WHERE ALLOWED, SHALL BE PROTECTED AT EACH PENETRATION WITH A CORRIDOR DAMPER INSTALLED IN ACCORDANCE WITH ITS LISTING.
- 9. FIRE DAMPER RATING SHALL BE 1.5 HOUR MINIMUM. FIRE DAMPERS SHALL ACTIVATE WHEN THE OPERATING TEMPERATURE IS 50° ABOVE THE NORMAL TEMPERATURE WITHIN THE DUCT, BUT NOT LESS THAN 160°F.
- 10. CORRIDOR DAMPER RATING SHALL BE 1.0 HOUR MINIMUM. CORRIDOR DAMPER LEAKAGE RATING SHALL BE CLASS 1 OF 11. CORRIDOR DAMPERS SHALL ACTIVATE MIREN THE OPERATING IS SET ABOVE THE RORMAL ELMERATURE WITHIN THE ID CORRIDOR DAMPERS SHALL BE IN ACCORDANCE WITHIN THE PROPERTY OF THE OPERATION OF SHALL BE IN ACCORDANCE WITHIN THE APPLICABLE CODE REQUIREMENTS AND SHALL BE SITE MISTALLED AND DESIGNED BY OTHERS UNLESS SPECIFED OTHERWISE ON THESE PLANS. ANY REQUIRED CONNECTIONS TO FIRE ALARM SYSTEMS, WHERE INSTALLED, SHALL BE SITE MISTALLED AND DESIGNED BY OTHERS.
- SHALL BE SIE INSTALLED AND DESIGNED BY OTHER SHAPE AND HARDWARE NO LESS THAN THE TIME RATING SPECIFIED ON THE FLOOR PLAN. FIRE RATED DOORS SHALL BE EQUIPED WITH SELF CLOSERS UNLESS OTHERWISE SPECIFIED. FIRE DOORS ASSEMBLES SHALL MET THE SMOKE AND DRAFT CONTROR REQUIREMENTS OF UL 1784. LOUVERS ARE PROMISEITED. DOORS SHALL BE INSTALLED IN ACCORDANCE WITH NFPA 8D. DOORS WITH A FIRE RATING ORGERTET THAN 20 MINUTES SHALL BE EQUIPPED WITH NONCOMBUSTIBLE SILLS PER NFPA 8D. SIDE-HINGED OR PIVOTED SWINGHON DOORS SHALL BE TESTED IN ACCORDANCE WITH NFPA 252 TEST THE NEUTRAL PRESSURE LEVEL IN THE FURNACE SHALL BE ESTABLISHED AT 40 INCHES OR LESS ABOVE THE SILL FIRE RATING LABEL ON DOORS SHALL BE MARKED WITH AN 'S'.



TYPICAL CEILING FRAMING AT CORRIDOR INTERSECTION

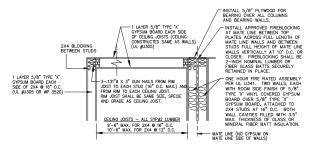


ONE HOUR WALLS & CEILING

TYPICAL FOR CORRIDOR WALLS & CEILING

JTES:

ONE CELUNO JOIST MAY BE CUT FOR INSTALLATION OF SUPPLY OR RETURN
ONE CELUNO JOIST MAY BE CUT FOR INSTALLATION OF SUPPLY OR RETURN
R, ETC., PROVIDED CUT JOIST IS SUPPORTED WITH THE SAME FRAMING AS
JULING JOIST, AND CELUNG JOIST ON EACH SIDE OF CUT JOIST IS DOUBLED,
INSTALL FLOOR JOIST DIRECTLY BELOW WALLS THAT ARE PARALLEL TO FLOOR
IST SPAN AND THAT SUPPORT CIFAR SPANS OFFATTE THAN A FEFT



ONE HOUR WALLS & CEILING
TYPICAL FOR CORRIDOR WALLS & CEILING AT DBL. MATE LINE WALLS
-NTS.-

NOTES:

1. ONE CEILING JOIST MAY BE CUT FOR INSTALLATION OF SUPPLY OR RETURN AR, ETC., PROVIDED CUT JOIST IS SUPPORTED WITH THE SAME FRAMING AS CEILING JOIST, AND CEILING JOIST CHAIR JOING JOINT BEAUTH STATE OF THE STATE STATE STATE THAT ARE PRABLLE TO FLOOR JOIST STANLA AND THAT SUPPORT ELERS PRANS GENETR THATA OF EACH THAT STATE OF THE STATE STATE THATA OF THE STATE STATE THATA OF THE STATE STATE THATA OF THE STATE STATE STATE THATA OF THE STATE STATE STATE THATA OF THE STATE STATE STATE STATE STATE THATA OF THE STATE STAT



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Sep 17, 2021

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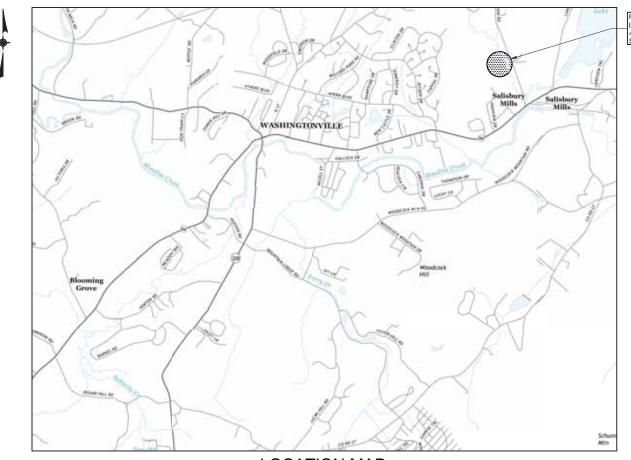
THERD PARTY DESIGN APPROVAL & INSPECTION AGENCY

## **TOWN OF BLOOMING GROVE**



# LASSER PARK SENIOR CENTER CONTRACT 1: STRUCTURAL FOUNDATIONS

**CONFORMED - AUGUST 2022** 



PROJECT LOCATION: LASSER PARK 49 STATION ROAD SALISBURY MILLS, NY 12577

	DRAWING LIST
DRAWING NO.	DRAWING TITLE
	GENERAL
	COVER SHEET
G1	SYMBOLS AND ABBREVIATIONS
G2	LASSER PARK - OVERALL SITE DEVELOPMENT PLAN
	CIVIL
C1	SITE PLAN
C2	EROSION AND SEDIMENT CONTROL PLAN
C3	DRAINAGE PLAN
C4	EROSION AND SEDIMENT CONTROL - DETAILS
C5	DETAILS!
	ARCHITECTURAL
A1	DOOR / WINDOWS SCHEDULE AND DETAILS
	STRUCTURAL
S1	STRUCTURAL AND FOUNDATION NOTES
S2	MODULAR BUILDING - FOUNDATION PLAN
53	MODULAR BUILDING - BASE RAIL SUPPORT PLAN
54	MODULAR FOUNDATION - EXTERIOR ELEVATIONS
\$5	MODULAR BUILDING - FOUNDATION DETAILS
58	MODULAR BUILDING - BEAM CONNECTION DETAILS

DE AMERICA LICT

LOCATION MAP





#### **CIVIL-EXISTING**

CONTOUR

TREE

SPOT ELEVATION

UTILITY POLE

LIGHT POLE

FENCE

TOP OF CURB ELEVATION BOTTOM OF CURB ELEVATION

(HEDGES, LARGE SHRUBS, ETC.)

STORM DRAIN MANHOLE

SANITARY SEWER MANHOLE

DRAINAGE INLET

FLECTRIC MANHOLE

TELEPHONE MANHOLE

CATCH BASIN

ELECTRIC LINE

TELEPHONE LINE

UNDERGROUND PROCESS PIPING

→ XI— AIR RELEASE VALVE

BUTTERFLY VALVE

SOLENOID VALVE ASSEMBLY

VENTURI METER

FLANGED FITTING

— PLUG VALVE

BACK PRESSURE CONTROL VALVE

GATE VALVE

(SEE ABBREVIATIONS FOR DESCRIPTIONS)

107.57+

## **CIVIL-PROPOSED**

SPOT FLEVATION

TOP OF CURB ELEVATION BOTTOM OF CURB ELEVATION

BELGIAN BLOCK CURB

STORM DRAIN MANHOLE

SANITARY SEWER MANHOLE

UNDERGROUND PROCESS PIPING

(SEE ABBREVIATIONS FOR DESCRIPTIONS)

FLOW SWITCH, FLOW INDICATOR

FLOW TRANSMITTER

LIMIT SWITCH

HOSE BIBB

AIR FILTER

INTAKE LOUVER

RPZ-BACKFLOW PREVENTER

AIR FLOW MEASURING STATION

PRESSURE GAUGE

ELECTRIC MANHOLE

TELEPHONE MANHOLE

CONTOUR

TREE

YARD INLET

CATCH BASIN

WATER MAIN

SANITARY SEWER

ASPHALT PAVEMENT

CONCRETE

SODDING

→ PD → PERIMETER/DIKE SWALE

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MECHANICAL/PLUMBING

#### **ELECTRICAL**

**SYMBOLS** 

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UP-2

ST

J

HOA

F d/b

480V DISCONNECT SWITCH, 3 POLE, 3 FUSE(a INDICATES SWITCH RATING AND b INDICATES FUSE RATING, IN AMPS)

LIGHT POLE 480V NON-FUSED DISCONNECT SWITCH (a INDICATES SWITCH RATING IN AMPS)

COMBINATION MOTOR STARTER

WALL BATTERY PACK - 2 LAMP FIXTURE. SEE SPECIFICATION FOR LIGHTING FIXTURE SCHEDULE

LIGHTING FIXTURE (UPPER CASE LETTER INDICATES TYPE, LOWER CASE LETTER INDICATES RESPECTIVE SWITCH, NUMERAL INDICATES CIRCUIT NUMBER) SE SPECIFICATION FOR LIGHTING FIXTURE SCHEDULE

DEVICE(SEE ABBREVIATIONS FOR TYPE)

240/120V UTILITY PANEL

HOME RUN TO PANELBOARD LETTERS AND NUMERALS INDICATE PANEL AND CIRCUIT NUMBER

INDICATES WIRE AND CONDUIT RUN (SEE CONDUIT AND CABLE SCHEDULE)

CONDUIT AND WIRING RUN EXPOSED

CONDUIT CONCEALED OR BURIED

CONDUIT (TURNED UP)

CONDUIT (TURNED DOWN)

CONDUIT FOR TELEPHONE SYSTEM

LIMIT SWITCH

FLOW SWITCH

CAPPED CONDUIT (EXPOSED)

JUNCTION BOX

CONVECTION HEATER

J

## ARCHITECTURAL/STRUCTURAL

### **EXISTING** EXISTING TO BE REMOVED (SEE NOTE 2)

GRATING

NEW (HIDDEN)

NEW CONCRETE

NEW MASONRY WALLS

EARTH

NEW CONCRETE (SITE PLANS ONLY)

#### NEW PAVEMENT (SITE PLANS ONLY)

#### **HVAC**



NEW YORK

24"X 12" SECTION DUCT SIZE — FIRST DIMENSION IS HORIZONTAL

#### **ELECTRICAL (CONTINUED)**

SWITCH(LOWER CASE LETTER INDICATES FIXTURES & EQUIPMENT TO BE SWITCHED)
(REFER TO SPECIFICATION FOR RATINGS) S<sub>3,a</sub> THREE-WAY SWITCH(LOWER CASE LETTER INDICATES FIXTURES AND EQUIPMENT TO BE SWITCHED)(REFER TO SPECIFICATION FOR RATINGS). DUPLEX RECEPTACLE, 2 POLE,3 WIRE,120V,20A,  $\Rightarrow$ 18" A.F.F. UNLESS OTHERWISE NOTED GRD FAULT CIRCUIT INTERRUPTER DUPLEX RECEPTACLE, 2 POLE 3 WIRE, 120V,20A,18" A.F.F. UNLESS OTHERWISE NOTED GFI -

> AIR TERMINAL FOR LIGHTNING PROTECTION SYSTEM GROUND ROD WITH INSPECTION WELL

RECEPTACLE, SPECIFIC PURPOSE - VERIFY REQMT

SECTION OF CONCRETE CONDUIT BANK

SOLENOID VALVE COIL ·To N.C. LIQUID LEVEL SWITCH

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MMD

N.C. AIR PRESSURE SWITCH

CONTROL STATION

TRANSFORMER (SEE SINGLE LINE DIAGRAM) TRANSFORMER-TYPE AND SIZE AS NOTED ON THE DRAWINGS AND IN

MICROPROCESSOR BASED METERING DEVICE (SEE SPECIFICATIONS)

CIRCUIT BREAKER (a INDICATES FRAME SIZE

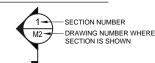
AND b INDICATES TRIP SIZE)

CIRCUIT BREAKER, DRAW OUT TYPE (a INDICATES TRIP SIZE)

#### **DETAIL REFERENCES**



#### **SECTION REFERENCES**



NOTE: ON THE SHEET THE SECTION/DETAIL IS LOCATED, THE BOTTOM NUMBER REFERENCES BACK TO THE SHEET WHERE IT FIRST APPEARS IN THE DRAWING SET.

#### MISCELLANEOUS SYMBOLS

INDICATES EXISTING BUILDINGS, STRUCTURES AND FEATURES, ETC. TO BE DEMOLISHED

PROPOSED

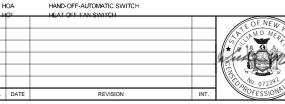
0'-0" (100.00) BUILDING ELEVATION (SITE ELEVATION)

- SYMBOLS/ ABBREVIATIONS LIST APPLIES TO ALL CONTRACTS
- THE REMOVAL SYMBOL APPLIES TO ALL ITEMS TO BE REMOVED INCLUDING CIVIL, MECHANICAL, PLUMBING, HEATING, VENTILATING ELECTRICAL ETC.

5708

## TOWN OF BLOOMING GROVE

**SYMBOLS AND ABBREVIATIONS** 



GENERAL CONTRACTOR

HIGH DENSITY POLYETHYLENE

GAS SERVICE

GATE VALVE

GROUND FAULT CIRCUIT INTERRUPTER

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DOCUMENT IS A VIOLATION OF SECTION 7209 OF THE NEW YORK STATE EDUCATION LAW. KA ΑE

AE

CHECKED

WDM

WATER SERVICE

WASHWATER WELDED WIRE FABRIC

D&B ENGINEERS AND ARCHITECTS

LASSER PARK SENIOR CENTER

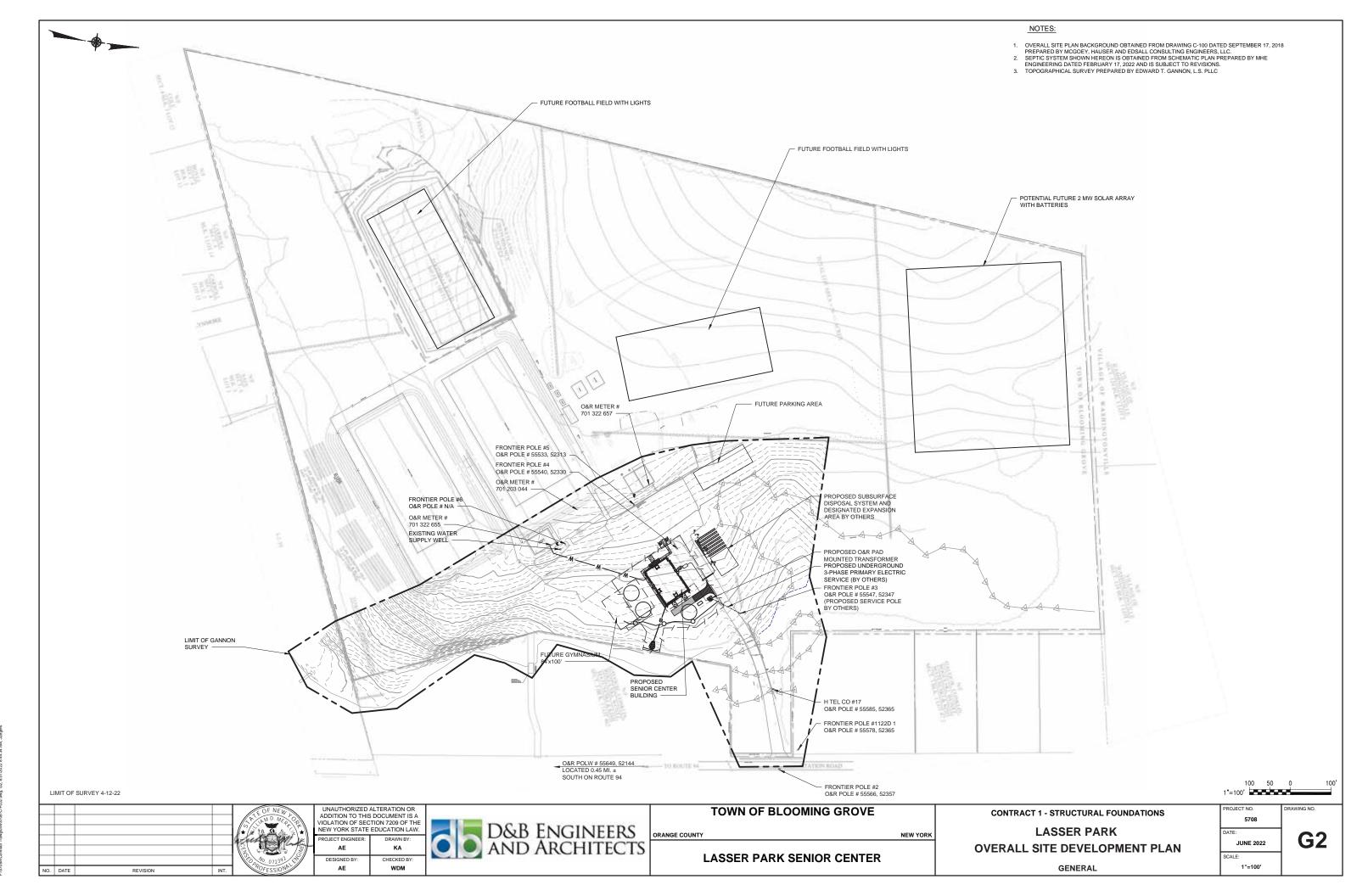
**GENERAL** 

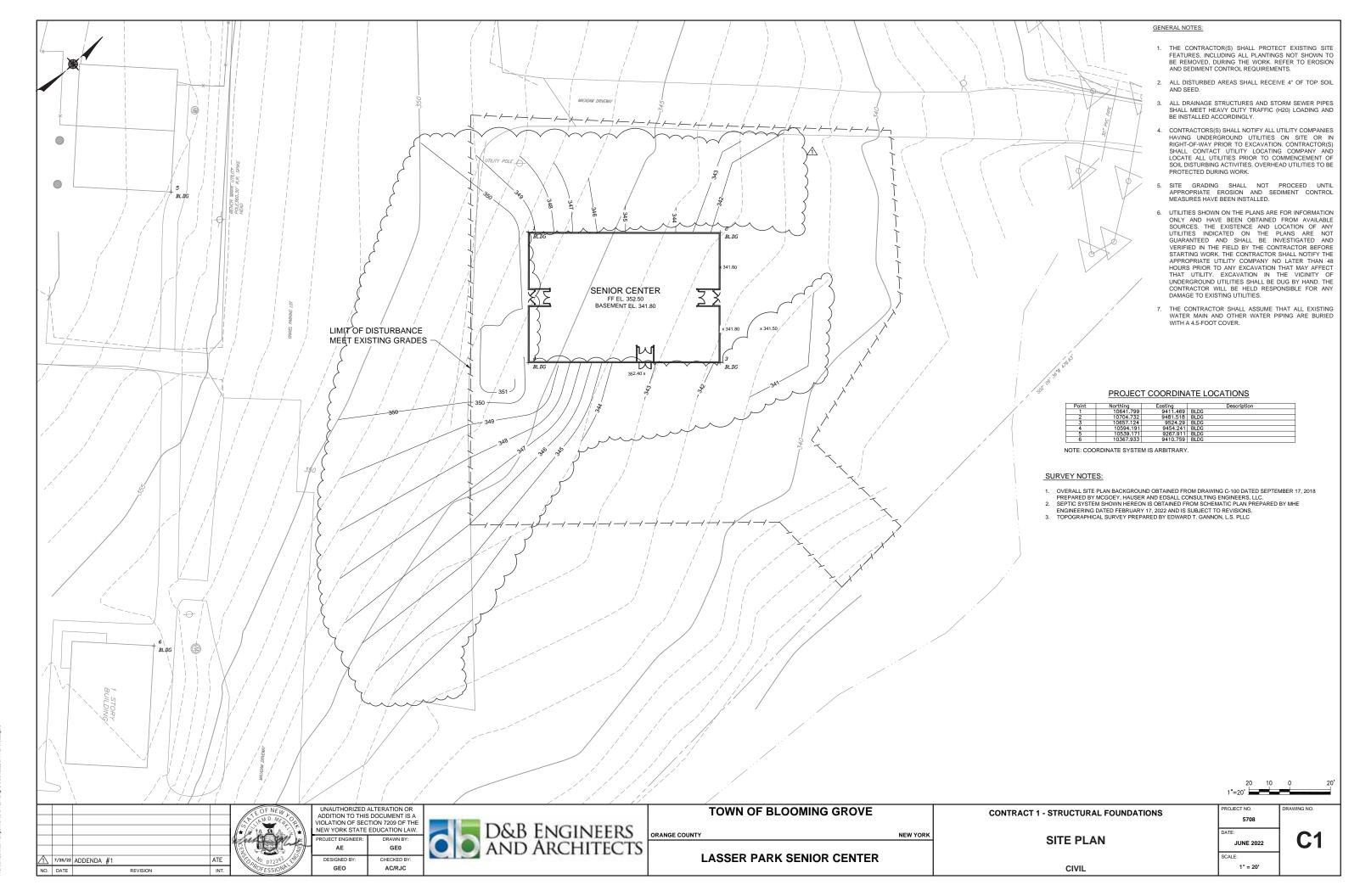
PLAN OF DUCT SIZE -FIRST DIMENSION IS SIDE SHOWN NOTES: VENTILATION DUCT TURN UP / TURN DOWN RESPECTIVELY 

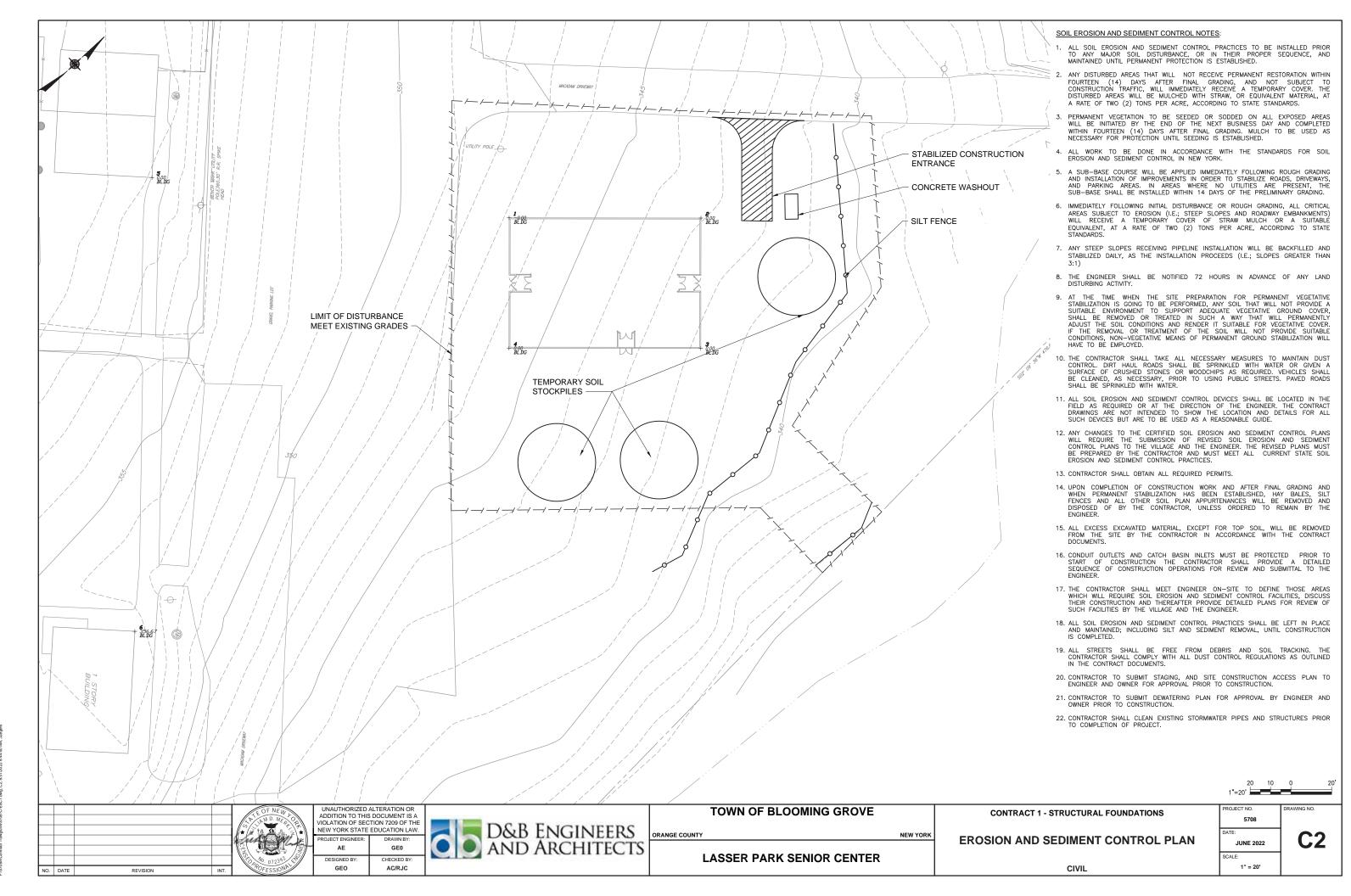
**CONTRACT 1 - STRUCTURAL FOUNDATIONS** 

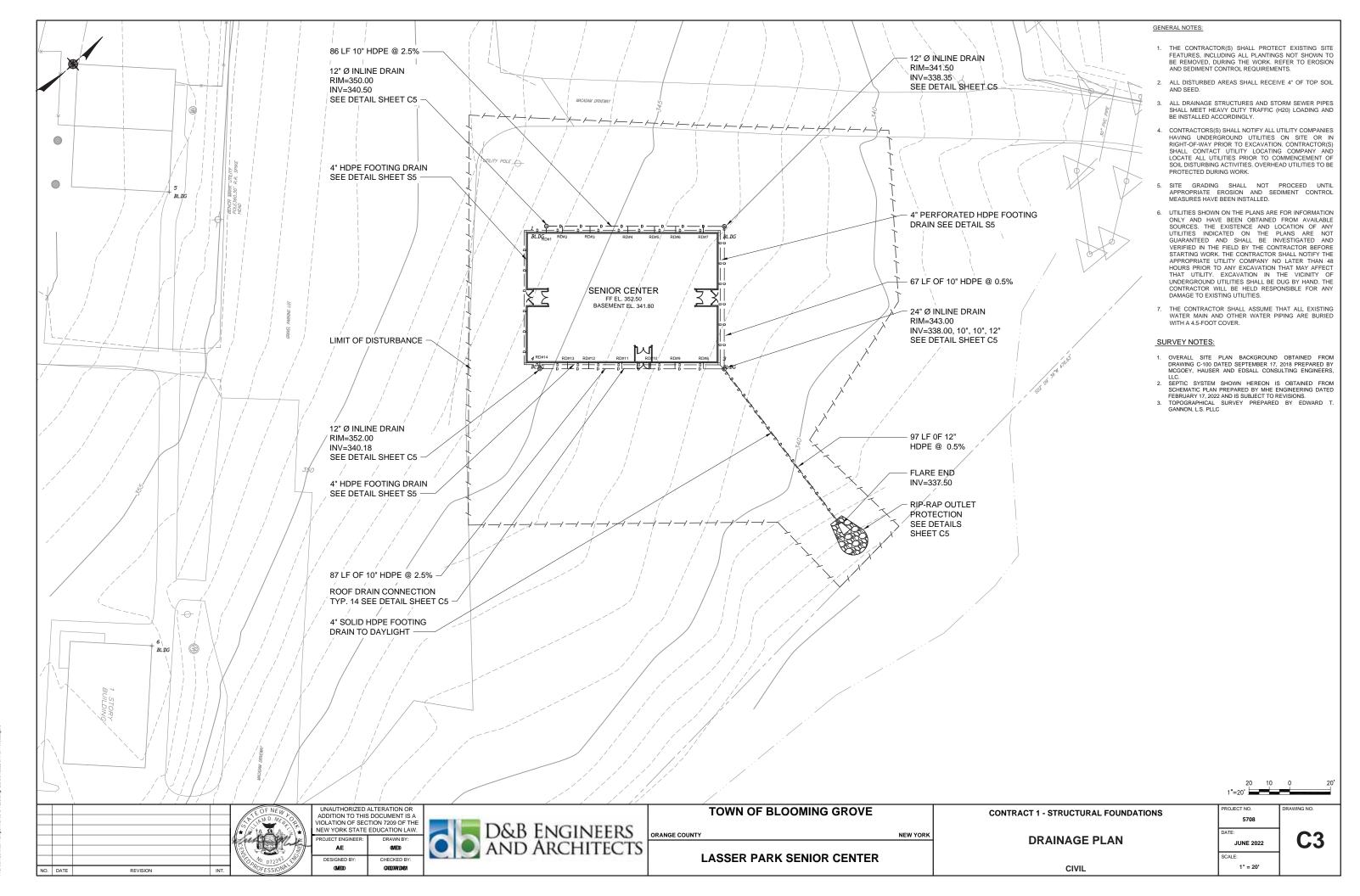
**G1** JUNE 2022

HDPE









#### STABILIZED CONSTRUCTION ENTRANCE DETAIL

#### NOTES:

- STONE SIZE USE 1 1/2 2 1/2" STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT. LENGTH -50 FEET MINIMUM.
- 3. THICKNESS NOT LESS THAN SIX (6) INCHES.

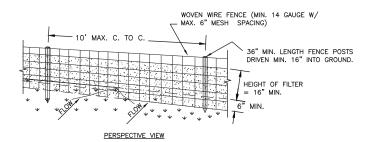
  4. WIDTH TWENTY FOUR (24) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE
- INGRESS OR EGRESS OCCURS. 5. FILTER CLOTH, MIRAFI OR APPROVED EQUAL, WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING
- 6. SURFACE WATER-ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL
- BE PERMITTED.

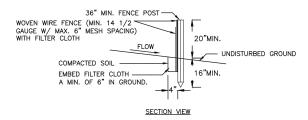
  MAINTENANCE THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PAVED SURFACES. ALL SEDIMENT SPILLED, DROPPED, WASHED, OR TRACTED ONTO PAVED SURFACES MUST BE REMOVED IMMEDIATELY.

  WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.

- 9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

  10. THE SITE SHALL BE MAINTAINED IN SUCH A WAY THAT ALL CONSTRUCTION VEHICLES EXTING THE SITE ONTO A PAVED SURFACE SHALL PASS OVER THE STABILIZED CONSTRUCTION ENTRANCE IF THEY HAVE TRANSVERSED OVER DISTURBED EARTH.

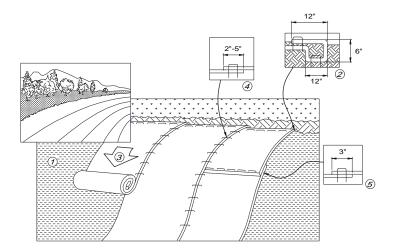


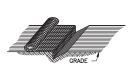


#### SEDIMENT FENCE DETAIL

SCALE: N.T.S.

- 1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES.
  POSTS SHALL BE STEEL EITHER "T" OR "U" TYPE OR HARDWOOD.
  2. FILTER CLOTH TO BE TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY
  24" AT TOP AND MID SECTION. FENCE SHALL BE WOVEN WIRE, 6" MAXIMUM MESH OPENING.
  3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVERLAPPED BY SIX
  INCHES AND FOLDED. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAFI 100X, STABILINKA T140N, OR
  APPROVED FOLIVALI ENT.
- PREFABRICATED UNITS SHALL BE GEOFAB, ENVIROFENCE, OR APPROVED EQUIVALENT.
- . MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

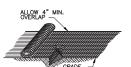




THE TOP AND BOTTOM OF SLOPES. BURY THE TOP ENDS OF THE MATTING STRIPS IN A TRENCH 4 INCHES OR MORE IN DEPTH

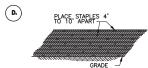


TAMP THE TRENCH FULL OF SOIL, SECURE WITH ROW OF STAPLES. 10 INCH SPACING 4 INCHES DOWN FROM TRENCH.



**(c.**)

OVERLAP—BURY UPPER END OF LOWER STRIP AS IN "A" AND "B" OVERLAP END OF TOP STRIP 4 INCHES AND STAPLE AT 10 INCH INTERVALS.



FROSION STOP-FOLD OF MATTING BURIED IN SILT TRENCH AND TAMPED. DOUBLE ROW OF STAPLES. EROSION STOPS SHOULD BE INSTALLED AT THE MIDPOINT OF SLOPES GREATER THAN 50 FEET IN LENGTH; OR AT 50 FOOT INTERVALS MEASURED FROM TOP OF SLOPES GREATER THAN 100 FEET IN LENGTH

#### **EROSION PROTECTION WITH SOIL STABILIZATION MATTING**

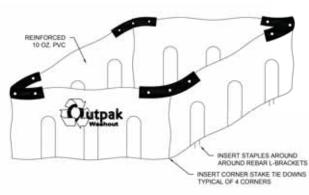
(A)

- 1. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE BLANKET IN A 6" WIDE TRENCH WITH APPROXIMATELY 12" OF BLANKET EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE BLANKET WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" APART IN THE BOTTOM OF THE TRENCH. BACK FILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO PREPARED SOIL AND FOLD REMAINING 12" PORTION OF THE BLANKET BACK OVER SEED AND SOIL. SECURE BLANKET OVER SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" APART ACROSS THE WIDTH OF THE BLANKETS WILL UNROLL WITH THE APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL BLANKETS MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE.

- 3. WHEN USING OPTIONAL DOT SYSTEM, STAPLES/STAKES SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN.
  4. THE EDGES OF PARALLEL BLANKETS MUST BE STAPLED WITH APPROXIMATELY 2"-5" OVERLAP DEPENDING ON BLANKET TYPE. TO ENSURE PROPER SEAM ALIGNMENT, PLACE THE EDGE OF
- THE OVERLAPPING BLANKET (BLANKET BEING INSTALLED ON TOP) EVEN WITH THE COLORED SEAM STITCH ON THE PREVIOUSLY INSTALLED BLANKET.

  5. CONSECUTIVE BLANKETS SPLICED DOWN THE SLOPE MUST BE PLACED ACCORDING TO DETAILS A. B. C. D.

  6. EROSION CONTROL BLANKETS SHALL BE INSTALLED FOLLOWING MANUFACTURERS SPECIFICATIONS.
- 7. IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" MAY BE NECESSARY TO PROPERLY ANCHOR THE BLANKETS.



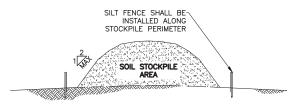
## OUTPAK PVC CONCRETE WASHOUT

#### NOTES:

- GENERAL CONTRACTOR TO USE OUTPAK PVC WASHOUT OR APPROVED EQUAL. THE WASHOUT SHALL BE INSTALLED PRIOR TO USING ANY MATERIALS THAT REQUIRE WASHOUT ON THIS PROJECT.
  AS NECESSARY, SIGNS SHALL BE PLACED THROUGHOUT THE SITE TO INDICATE THE LOCATION OF THE WASHOUT.
  THE WASHOUT AREA WILL BE REPLACED AS NECESSARY TO MAINTAIN CARACITY EOR LIQUID WASTE

- CAPACITY FOR LIQUID WASTE.
  WASHOUT RESIDUE SHALL BE REMOVED FROM THE SITE AND DISPOSED OF
  AT AN APPROVED WASTE FACILITY.
- DO NOT WASHOUT INTO STORM DRAINS, OPEN DITCHES, STREETS, OR STREAMS
- NOID DUMPING EXCESS CONCRETE IN NON-DESIGNATED DUMPING AREAS.
   LOCATED WASHOUT AT LEAST 50' (15 METERS) FROM STORM DRAIN, OPEN
- DITCHES, OR WATER BODIES.

  THE WASHOUT SHALL BE USED ONLY FOR NON-HAZARDOUS WASTES.



NOTE:
SOIL STOCKPILES TO REMAIN INACTIVE FOR 7 DAYS OR GREATER MUST BE STABILIZED WITH TEMPORARY SEEDING OR MULCH (DEPENDING UPON WEATHER CONDITIONS) AND ENCLOSED WITH SILT FENCE. CONSTRUCTION SPECIFICATIONS FOR TEMPORARY VEGETATIVE COVER

A) RYE GRASS (ANNUAL OR PERENNIAL) AT 30 LBS. PER ACRE (0.7 B) CERTIFIED "AROOSTOOK" WINTER RYE (CEREAL RYE) AT 100 LBS. PER

ACRE (2.5 LBS/SF) METHOD OF DUST CONTROL. TEMPORARY SEEDING SHALL BE AS FOLLOWS:

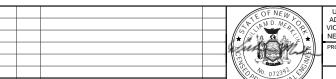
USE WINTER RYE IF SEEDING IN OCTOBER/NOVEMBER. HYDROSEED OR USE OF EROSION CONTROL BLANKETS/ANCHORING MAY BE NECESSARY TO ENSURE GOOD SEED TO SOIL CONTACT ON STEEP SLOPES AND TO MAINTAIN MOISTURE.

MULCH (INCLUDING GRAVEL MULCH) — MULCH OFFERS A FAST EFFECTIVE MEANS OF CONTROLLING DUST AND PROVIDES FOR STABILIZATION IN WINTER MONTHS. APPLICATION OF HAY MULCH SHALL BE 90LBS./1,000 SF WITH UNIFORM APPLICATION OR APPROVED EQUAL. MULCH ANCHORING OR MACHINE TRACKING MAY BE NECESSARY TO ENSURE STABILIZATION.

SOIL STOCKPILE DETAIL

**CONTRACT 1 - STRUCTURAL FOUNDATIONS** 

SCALE: N.T.S.



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TOWN OF BLOOMING GROVE

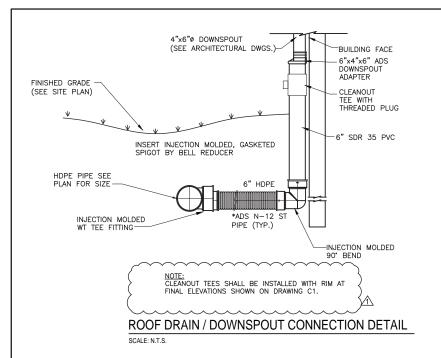
NEW YORK

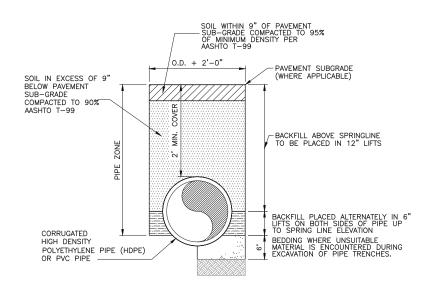
**EROSION AND SEDIMENT CONTROL DETAILS** 

5708 JUNE 2022

AS SHOWN

LASSER PARK SENIOR CENTER





#### TYPICAL DRAINAGE TRENCH DETAIL

NOTES:

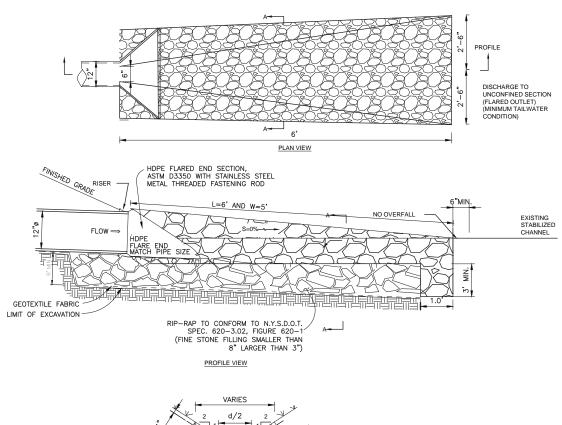
1. COMPACTED BACKFILL MATERIAL REQUIRED IN ALL PIPE ZONES,
PER USCS (UNIFIED SOIL CLASSIFICATION SYSTEM).

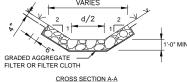
2. IF DEPTH OF TRENCH EXCEEDS 5', THE CONTRACTOR MUST PROVIDE
SHEETING AND BRACING OR A SHEETING BOX IN ACCORDANCE WITH OSHA
REGULATIONS AS AN ALTERNATIVE. IF PERMITTED BY THE ENGINEER, THE TRENCH
WALLS MAY BE CUT BACK TO A 1:1 SLOPE OR NATURAL ANGLE OF REPOSE
FOR THE SOIL, WHICHEVER IS GREATER.

3. WHERE PIPE IS INSTALLED WITH LESS THAN 3' OF COVER WITHIN PAVEMENT
AREAS, ALL BACKFILL MATERIAL THROUGHOUT THE PIPE ZONE IS TO BE CLASS I
MATERIAL.

MATERIAL.

4. TESTING REQUIRED PER DISCRETION OF ENGINEER OR INSPECTOR.

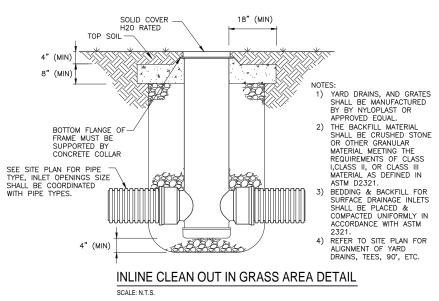




NOTES: SEE RIPRAP STANDARDS AND SPECIFICATIONS MINIMUM TAILWATER CONDITIONS APRON @ ZERO GRADE; SIDE SLOPE 2:1

#### FLARE END RIPRAP OUTLET PROTECTION DETAIL

SCALE: N.T.S.



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	TOWN OF BLOOMING GROVE	
ORANGE COUNTY		NEW YORK

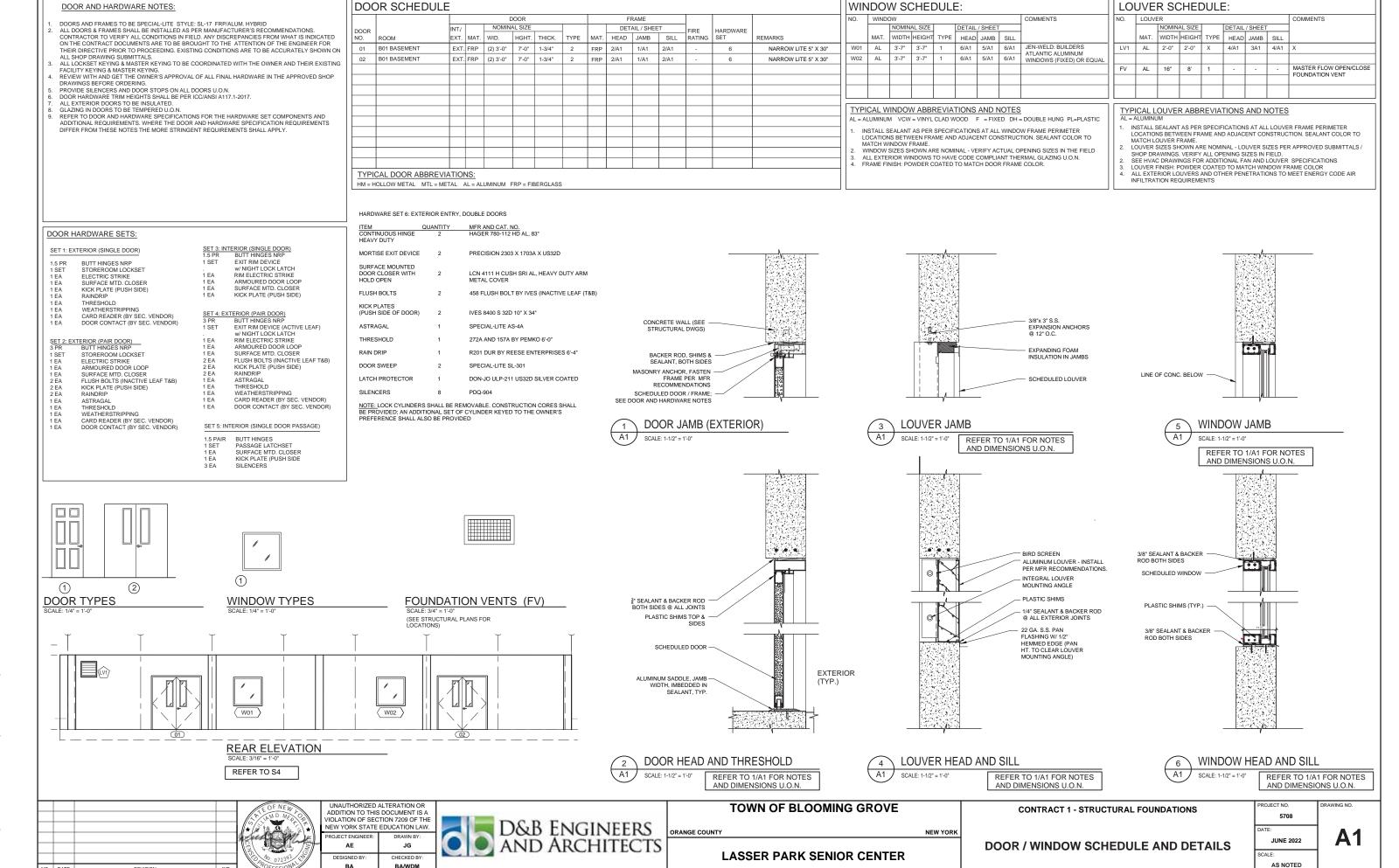
**CONTRACT 1 - STRUCTURAL FOUNDATIONS** 

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#### **GENERAL**

- ALL WORK SHALL BE PERFORMED IN STRICT ACCORDANCE WITH THE NEW YORK STATE BUILDING CODE AND WITH THE RULES AND REGULATIONS OF ALL LOCAL AGENCIES DEPARTMENTS OR LAWS HAVING JURISDICTION OVER ANY PORTION OF ASE OF THE WORK. THE CONTRACTOR SHALL COORDINATE THE WORK TH PUBLIC UTILITY COMPANIES HAVING JURISDICTION.
- 2. THE CONTRACTOR SHALL OBTAIN ANY AND ALL PERMITS REQUIRED FOR THE PERFORMANCE OF THE WORK AND PAY ALL FEES IN CONNECTION THEREOF
- CONTRACTOR SHALL COORDINATE STRUCTURAL DRAWINGS WITH ARCHITECTURAL, MECHANICAL & ELECTRICAL DRAWINGS.
- THE SIZE AND LOCATION OF ALL EQUIPMENT PADS AND PENETRATIONS THROUGH THE STRUCTURE SHALL BE VERIFIED BY THE GENERAL. ELECTRICAL AND PLUMBING CONTRACTORS. ALL PENETRATIONS SHALL BE SUBJECT TO APPROVAL BY THE
- 5. THE CONTRACTOR SHALL NOT MAKE DEVIATIONS FROM DESIGN DRAWINGS WITHOUT WRITTEN APPROVAL FROM THE ARCHITECT/ENGINEER.
- 6. IF THERE IS A DISCREPANCY ON THE CONSTRUCTION DOCUMENTS. THE ARCHITECT/ENGINEER SHALL BE NOTIFIED IMMEDIATELY SO THAT THE DISCREPANCY CAN BE RESOLVED. UNLESS OTHERWISE INDICATED IN WRITING BY THE ARCHITECT/ENGINEER, THE MORE CONSERVATIVE INTERPRETATION OF THE
- DO NOT SCALE DRAWINGS. WRITTEN DIMENSIONS CONFIRMED BY FIELD CONDITIONS TAKE PRECEDENCE, IF DISCREPANCY ARISES BASED ON FIELD CONDITIONS, CONSULT WITH ARCHITECT/ENGINEER BEFORE PROCEEDING WITH WORK OR ORDERING
- ALL SECTIONS AND DETAILS SHALL BE CONSIDERED TYPICAL AND APPLY FOR THE SAME AND SIMILAR CONDITIONS, UNLESS OTHERWISE SPECIFICALLY NOTED.
- 9. ANY ITEM OF WORK NECESSARY FOR PROPER COMPLETION OF CONSTRUCTION WHICH IS NOT SPECIFICALLY COVERED ON THE DRAWINGS OR IN THE SPECIFICATIONS, SHALL BE CONSIDERED INCLUDED IN THIS WORK AND SHALL BE PERFORMED IN A MANNER DEEMED GOOD PRACTICE OF THE TRADE INVOLVED.
- 10. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR THE SAFETY OF THE PUBLIC AND PROPERTY DURING CONSTRUCTION OPERATIONS AND UNTIL COMPLETION OF ALL
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADEQUATELY BRACING AND PROTECTING ALL WORK DURING CONSTRUCTION AGAINST DAMAGE, BREAKAGE, COLLAPSE, DISTORTION OR MISALIGNMENT. CONTRACTOR SHALL REPAIR OR REPLACE SUCH DAMAGE OR DISTURBANCE TO ORIGINAL PRE-CONSTRUCTION CONDITION
- 12. THE ARCHITECT/ENGINEER SHALL NOT BE RESPONSIBLE FOR THE PERFORMANCE OR SUBCONTRACTORS NOR SHALL HE GUARANTEE THEIR PERFORMANCE
- 13. CONTRACTOR SHALL NOTIFY ARCHITECT/ENGINEER IMMEDIATELY IF HE OR SHE CANNOT COMPLY WITH ANY REQUIREMENTS.
- 14 THE ENGINEER SHALL NOT BE RESPONSIBLE FOR ANY CHANGES TO THIS PROJECT MADE BY OWNER, GENERAL CONTRACTOR OR ANY SUBCONTRACTOR OR MATERIAL SUPPLIER UNLESS SPECIFICALLY AUTHORIZED, IN WRITING, BY THE ENGINEER.

#### REFERENCES:

- 1. ALL ELEVATIONS ARE REFERENCED TO THE NAVD '88 DATUM
- 2. BASE PLAN AND SECTION IS DEVELOPED FROM:
- 2.1. SURVEY DRAWING DATED 01/21/2022 BY MHE ENGINEERING
- 3. SOIL DATA OBTAINED FROM
- 4. GEOTECHNICAL EVALUATION REPORT DATED 10/02/2021 BY KEVIN L. PATTON, P.E.
- 5. THE CONTRACTOR IS RESPONSIBLE FOR VERIFICATION OF ALL DIMENSIONS IN THE FIELD, IF CONDITIONS OBSERVED IN THE FIELD DIFFER FROM THESE DRAWINGS. THE CONTRACTOR SHALL NOTIFY THE ENGINEER TO EVALUATE THE CONDITION. MODIFICATIONS TO THESE DRAWINGS MAY BE NECESSARY

#### **DEWATERING NOTES:**

- ANY WATER INFLOW INTO THE EXCAVATION AREA SHALL BE CONTROLLED BY SUMPING OR OTHER SUITABLE METHODS. DISPOSAL OF WATER SHALL BE MADE OUT OF THE EXCAVATED AREA IN ACCORDANCE WITH LOCAL REGULATIONS. THE ELEVATION OF THE WATER LEVELS BEYOND THE LIMITS OF THE PROJECT SITE SHALL NOT BE LOWERED SO AS TO CAUSE DISTRESS AND/OR SETTLEMENT TO ADJOINING STRUCTURES. CONTRACTOR SHALL PROVIDE MEANS AND METHODS TO PREVENT LOSS OF FINES DURING DEWATERING.
- 2. THE CONTRACTOR IS RESPONSIBLE FOR ANY DEWATERING THAT MAY BE REQUIRED FOR THIS PROJECT.
- IF DEWATERING SYSTEM IS REQUIRED, THE CONTRACTOR SHALL CONSULT A DEWATERING ENGINEER.

#### **EXCAVATION**

- 1. BEFORE STARTING EXCAVATION, CONTRACTOR SHALL CALL 811 FOR UTILITY COMPANIES TO MARK OUT ALL BELOW GRADE EXISTING UTILITY LINES.
- PRIOR TO COMMENCEMENT OF MASS EXCAVATION, THE ADJACENT STREET, SIDEWALK, AND ADJACENT STRUCTURES WITHIN THE INFLUENCE OF THE EXCAVATION SHALL BE VISUALLY SURVEYED BY THE CONTRACTOR AND SUITABLY MARKED WITH MONITORING POINTS TO BE MEASURED DURING CONSTRUCTION FOR THE PURPOSE OF DETERMINING ANY CONSTRUCTION RELATED EFFECTS FROM THE EXCAVATION WORK
- A PRE-CONSTRUCTION DAMAGE CONDITION REPORT OF THE ADJOINING PROPERTIES SHALL BE MADE IN WRITTEN AND PICTORIAL FORM, WITH AN ELECTRONIC COPY SUBMITTED TO THE DISTRICT AND ENGINEER OF RECORD BEFORE COMMENCING EXCAVATION.
- A COMPETENT REPRESENTATIVE OF THE CONTRACTOR SHALL INSPECT THE SUBGRADE OF THE EXCAVATION, AND ALL SUPPORT OF EXCAVATION STRUCTURES AT THE COMMENCEMENT OF WORK EACH DAY.
- . THE CONTRACTOR SHALL BECOME FAMILIAR WITH THE SUBGRADE CONDITIONS PRIOR TO THE START OF WORK. THESE DRAWINGS DISCOUNT UNDERGROUND WATER
- 5. THE CONTRACTOR SHALL PROVIDE ANY TEMPORARY EXCAVATION RESTRAINT REQUIRED FOR THE CONSTRUCTION OF THIS PROJECT. CONTRACTOR SHALL PROVIDE SHOP DRAWINGS TO BE APPROVED PRIOR TO THE START OF WORK.
- 6. ALL EXCAVATION GREATER THAN 5 FOOT IN DEPTH SHALL BE SHEETED, LAGGED, OR
- ALL EXCAVATIONS GREATER THAN 10 FEET IN DEPTH SHALL REQUIRE NYS PE SIGNED AND SEALED CALCULATIONS AND SHOP DRAWINGS PRIOR TO THE COMMENCEMENT OF EXCAVATION WORK
- 8. WHERE BRACING IS USED TO SUPPORT THE EXCAVATION, PROVIDE STEEL WEDGES PROPERLY DRIVEN INTO THE JOINTS UNTIL THE NECESSARY REACTION IS PROVIDED
- 9. NO MATERIALS SHALL BE PLACED WITHIN 10 FEET OF THE EXCAVATION PERIMETER.
- 10. BOTTOM OF EXCAVATION ELEVATION AS SHOWN ON THESE DRAWINGS SHALL BE VERIFIED AND COORDINATED IN FIELD WITH CONTRACT DOCUMENTS.
- 11. EXCAVATION ELEVATIONS SHOWN ON THESE DRAWINGS ARE BASED ON ELEVATIONS SHOWN ON THE REFERENCED DOCUMENTS. ADDITIONAL EXCAVATION MAY BE REQUIRED AS PER STRUCTURAL DESIGN AND CONSTRUCTION REQUIREMENTS.
- 12. IF THE CONDITIONS OBSERVED AS THE EXCAVATION ADVANCES ARE DIFFERENT THAN THE CONDITIONS SHOWN ON THE DESIGN DRAWINGS, THE CONTRACTOR SHALL STOP WORK AND NOTIFY THE CONSTRUCTION MANAGER AND ENGINEER.
- 13. USE HAND TOOLS TO EXCAVATE WITHIN 5-FT OF UNDERGROUND UTILITIES.
- 14. PROVIDE BLOCK OUTS USING HIGH DENSITY FOAM IN CONCRETE STRUCTURE WHERE SHORING STRUCTURE ELEMENTS PENETRATE NEW FOUNDATION WALL
- 15. HAY OR FILTER FABRIC SHALL BE USED TO MINIMIZE MIGRATION OF FINES INTO THE

#### SAFETY DURING EXCAVATION WORK:

- THESE DRAWINGS DO NOT ADDRESS SAFETY ISSUES RELATED TO THE EXCAVATION AND SHORING WORK. OTHERS SHALL BE RESPONSIBLE FOR SITE SAFETY AND PROVIDE A SAFETY PLAN CONFORMING TO OSHA AND ALL APPLICABLE LAWS.
- 2. THE CONTRACTOR SHALL PROVIDE BARRIERS AND FENCING AROUND SITE IN ADDITION TO PROTECTION FOR ALL ADJACENT SIDEWALKS AND ADJOINING PROPERTIES IN ACCORDANCE WITH THE BUILDING CODE OF NEW YORK STATE AND ALL APPLICABLE
- 3. THE CONTRACTOR SHALL BE COMPLETELY RESPONSIBLE FOR THE SAFETY OF ALL ADJACENT STRUCTURES. IF DAMAGE OCCURS TO ADJACENT BUILDING ELEMENTS DUE TO THE NEGLIGENCE OF THE CONTRACTOR, THE CONTRACTOR SHALL BE HELD RESPONSIBLE TO RECTIFY ALL DAMAGE AND/OR REMBURSE PROPERTY OWNERS FOR ANY AND ALL DAMAGES, TO THE SATISFACTION OF ALL CONCERNED PARTIES.
- 4 THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING CONDITIONS OF PUBLIC AND WORKER SAFETY DURING EXECUTION OF THE WORK. THIS SHALL INCLUDE AND WORKER SAFETY DURING EXECUTION OF THE WORK. THIS SHALL INCLUDE COMPLIANCE WITH CHAPTER 33 OF THE BUILDING CODE OF NEW YORK STATE: SAFEGUARDS DURING CONSTRUCTION, OSHA PART 1926, AND OTHER STATE AND LOCAL LABOR LAWS WHICH MAY GOVERN THIS TYPE OF WORK.
- 5. THE CONTRACTOR SHALL PROVIDE REGULAR, PERIODIC INSPECTIONS OF CONSTRUCTION OPERATIONS AS REQUIRED TO ENSURE ONGOING MAINTENANCE OF ALL SAFETY OPERATIONS AND EQUIPMENT. SUCH INSPECTIONS SHALL BE UNDERTAKEN BY AN AGENT OF THE CONTRACTOR WHO IS QUALIFIED TO EVALUATE SUCH OPERATIONS AND EQUIPMENT. THIS INSPECTOR SHALL PREPARE WRITTEN SAFETY REPORTS WHICH SHALL BE MAINTAINED AT THE JOB SITE FOR REVIEW BY AUTHORITIES HAVING JURISDICTION.
- OBSERVED MOVEMENTS OF THE SUPPORT OF EXCAVATION OR OTHER STRUCTURES SHALL BE BROUGHT TO THE ATTENTION OF THE CONSTRUCTION MANAGER AND

#### CAST IN PLACE CONCRETE

- ALL CONCRETE WORK SHALL CONFORM TO ACI-318 SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS AND OTHER STRUCTURES AND ACI-301 BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE, LATEST EDITION.
- ALL CONCRETE SUPERSTRUCTURE AND FOUNDATIONS SHALL BE 4000 P.S.I. NORMAL WEIGHT STONE CONCRETE, AIR ENTRAINED AS PER THE SPECIFICATIONS. THE VALUES LISTED ARE A MINIMUM CONCRETE COMPRESSIVE STRENGTH AT 28 DAYS AFTER POUR.
- 3. ALL DEFORMED REINFORCING STEEL SHALL CONFORM TO ASTM A-615, GRADE 60.
- NO ADMIXTURE SHALL BE ALLOWED WITHOUT PRIOR APPROVAL OF THE ENGINEER. CALCIUM CHLORIDE SHALL NOT BE USED IN CONCRETE MIXES.
- ALL REQUIREMENTS FOR BATCHING, MIXING, FINISHING, CURING ETC, SHALL BE AS PER
- WELDED WIRE FABRIC SHALL CONFORM TO ASTM A-185 WITH A MINIMUM ULTIMATE STRENGTH OF 70,000 PSI. EPOXY COATED WIRE SHALL CONFORM TO ASTM A 884
- 7. REINFORCING BARS SHALL BE LAP SPLICED AS INDICATED ON THE DRAWINGS. THE LAP SPLICES SHALL BE ACI CLASS 'B' UNLESS NOTED. ENGINEER OF RECORD TO REVIEW AND APPROVE ANY MECHANICAL SPLICE CONNECTIONS FOR REBAR.
- ALL 90 DEGREE AND 180 DEGREE HOOKS SHALL BE ACI STD HOOKS UNLESS OTHERWISE INDICATED.
- MINIMUM CONCRETE COVERING OF REINFORCING STEEL SHALL BE AS FOLLOWS: CAST AGAINST EARTH: SLABS & WALLS FOOTINGS & MAT SLAB
- 10. PROVIDE PROPER HIGH CHAIRS, SPACERS AND SUPPORTS TO HOLD REINFORCING SECURELY IN PLACE WHILE PLACING CONCRETE.
- 11. THE CONTRACTOR SHALL ASCERTAIN LOCATION OF ALL SLEEVES, INSERTS ANCHOR BOLTS, ETC, REQUIRED, INSTALLATION OF ALL SUCH EMBEDMENTS SHALL BE CHECKED FOR COMPLETENESS AND LOCATION BEFORE CONCRETE IS POURED AND COORDINATED WITH SHOP DRAWINGS OF TRADES REQUIRING THESE ITEMS. MINIMUM CONCRETE BETWEEN SLEEVES SHALL BE 8 INCHES, UNLESS OTHERWISE NOTED.
- 12. FOR EMBEDDED INSERT LOCATIONS, DETAILS, ELEVATIONS, ETC. NOT SHOWN ON THE STRUCTURAL DRAWINGS REFER TO THE MECHANICAL DRAWINGS
- 13. UNLESS OTHERWISE NOTED, REINFORCING BARS OR WELDED WIRE FABRIC SHALL BE WELDED, TACK-WELDED OR USED FOR STRIKING AN ARC
- 14. THROUGHOUT CONSTRUCTION, THE CONCRETE WORK SHALL BE ADEQUATELY PROTECTED AGAINST DAMAGE DUE TO EXCESSIVE LOADING, CONSTRUCTION EQUIPMENT, MATERIALS OR METHODS, ICE, RAIN, SNOW, EXCESSIVE HEAT AND FREEZING TEMPERATURES.
- 15. EARLY DRYING OUT OF CONCRETE, ESPECIALLY DURING THE FIRST 24 HOURS, SHALL BE CAREFULLY GUARDED AGAINST. ALL SURFACES SHALL BE MOIST CURED OR PROTECTED USING A MEMBRANE CURING AGENT APPLIED AS SOON AS FORMS ARE REMOVED. IF MEMBRANE CURING AGENT IS USED, EXERCISE CARE NOT TO DAMAGE
- 16. CONTROL JOINTS IN FOUNDATION WALLS SHALL BE PLACED A MAXIMUM OF 40'-0" O.C. AND A MINIMUM OF 4'-0" FROM COLUMN LINES / PIER LOCATIONS
- 17. CONCRETE SURFACE FINISHES:

  TODE SLAB: STEEL TROWEL FINISH

TABLE OF REINFORCING STEEL AND DEVELOPMENT MIN.

#### SPLICE LENGTHS (INCHES) f'c=4000psi, fv=60ksi TENSION LAP COMPRESSION COMPRESSION BAR SIZE DEVEL OPMENT DEVELOPMENT LAP SPLICE SPLICE CLASS B LENGTH LENGTH 23

- 1. USE TENSION LAP LENGTH IN ALL LAP SPLICES OF BARS, EXCEPT FOR SPLICES OF VERTICAL COLUMN BARS AND AS SHOWN ON DWGS
- 2. THE SPLICES OF VERTICAL COLUMN BARS SHALL BE COMPRESSION. LAP SPLICES, EXCEPT AS INDICATED ON SPECIFIC DETAILS AS TENSION LAP SPLICES.
- 3. USE TENSION AND COMPRESSION DEVELOPMENT LENGTHS AT LOCATIONS AS INDICATED ON THE DRAWINGS.

#### CONCRETE SLABS - SLAB-ON-GRADE

- WELDED WIRE FABRIC FOR CONCRETE SLABS ON GRADE SHALL BE PLACED 2" BELOW WEDDED WINE PARKET PACED SET TOP OF START OF START OF THE START OF START OF THE START OF START OF THE START OF START OF
- 2. CONSTRUCT CONTROL JOINTS IN SLABS-ON-GRADE AS INDICATED ON DRAWINGS.
- 3. LOCATION OF ALL JOINTS IN CONCRETE SLABS ON GRADE TO BE COORDINATED BY GENERAL CONTRACTOR WITH JOINTS IN FLOOR AND WALL FINISHES AND REVIEWED
- 4. PROPER CURING PROCEDURES AS PER ACI 308, INCLUDING HOT AND COLD WEATHER CONCRETING PROVISIONS, SHALL BE USED FOR ALL CONCRETE SLABS.

#### **GROUT**

- GROUTING BELOW STEEL BEARING PLATES, AND AS OTHERWISE SHOWN ON THE DRAWINGS SHALL BE NON SHRINK, NON METALIC GROUT WITH A MINIMUM COMPRESSIVE STRENGTH OF 2000 PSI AT 1 DAY AND 6000 PSI AFTER 7 DAYS,
- 2. GROUT REFERRED TO AS 'DRY PACK' SHALL MEET THE STRENGTH REQUIREMENTS ABOVE BUT HAVE A LOW WATER CONTENT SO THAT IT WOULD BE STIFF ENOUGH TO BE
- 3. GROUT THAT NEEDS TO BE INSTALLED THICKER THAN 3" IN THE VERTICAL DIMENSION
- 4. CONTRACTOR SHALL SUBMIT MANUFACTURER'S DATA ON GROUT TO BE USED, AS WELL AS DESIGN MIXES FOR GROUT WITH ADDED PEA GRAVEL, TO THE ARCHITECT/ENGINEER FOR REVIEW AND APPROVAL.

#### STRUCTURAL TESTS & "SPECIAL" INSPECTION

ALL MATERIALS, ASSEMBLIES, METHODS OF CONSTRUCTION AND SERVICE EQUIPMENT HALL COMPLY WITH N.Y.S. BUILDING CODE REQUIREMENTS FOR "STRUCTURAL TESTS & SPECIAL INSPECTIONS AND ACCEPTANCE" CHAPTER 17.

- DETAILED REQUIREMENTS OF INSPECTION AND TESTING WILL COMPLY WITH
  CHAPTERS 17 AND CHAPTER 18 OF THE N.Y.S. BUILDING CODE. BUILDING DEPARTMENT
  FORMS ARE TO BE FILED FOR THE FOLLOWING AREAS FOR THE STRUCTURAL WORK:

  ONLY THE STRUCTURAL WORK:
  - STEEL CONSTRUCTION (1705.2)

  - A. STEEL CONSTRUCTION (1705.2)

    B. CONCRETE CONSTRUCTION (1705.3)

    C. SOILS (1705.6)

    D. DESIGN STRENGTHS OF MATERIALS (1706)
- 3. THE GENERAL CONTRACTOR SHALL CONTACT THE TOWN OF BLOOMING GROVE TO ARRANGE FOR THE THE SERVICES OF THIRD PARTY N.Y. STATE P.E. & NYS LICENSED TESTING LABORATORY UNDER CONTRACT WITH THE TOWN TO PROVIDE ALL TESTING AND INSPECTION SERVICES REQUIRED
- GENERAL CONTRACTOR SHALL COORDINATE ALL INSPECTIONS WITH THE TOWN OF BLOOMING GROVE, THE TESTING AGENCY, ENGINEER OF RECORD, AND CONSTRUCTION MANAGER, PRIOR TO THE START OF WORK, CONTRACTOR SHALL NOTIFY THE TOWN 48 HOURS AHEAD OF ANY STRUCTURAL WORK REQUIRING VISUAL INSPECTION OR OBSERVATION.

#### STRUCTURAL STEEL

- ALL STRUCTURAL STEEL WORK SHALL CONFORM TO THE AISC SPECIFICATIONS FOR STRUCTURAL STEEL BUILDINGS INCLUDING THE CODE OF STANDARD PRACTICE AND RCSC SPECIFICATIONS FOR STRUCTURAL JOINTS USING ASTM A325 OR A490 BOLTS.
- 2. STRUCTURAL STEEL SHALL CONFORM TO THE FOLLOWING MINIMUM YIELD STRENGTHS AND SPECIFICATIONS, UNLESS OTHERWISE NOTED

	YIELD	ASTM SPEC.
STRUCTURAL STEEL SHAPES:	50 K.S.I.	A-992
PLATES & CONNECTION MATERIAL	36 K.S.I.	A-36
STRUCTURAL STEEL PIPE:	36 K.S.I.	A-53 GR B
STRUCTURAL STEEL TUBING:	46 K.S.I.	A-500
VIICHUD BUILTS:	EE K C I	E 1664 CD 66

- 3. ALL BOLTED STEEL BEAM AND COLUMN CONNECTIONS SHALL BE ERECTED. WITH 3/4
- 4. DIRECT TENSION INDICATORS CONFORMING TO ASTM F959, TYPE AS REQUIRED, CAN BE USED ON ALL A325 AND A490 BOLTS ON CONNECTIONS THAT ARE SLIP CRITICAL.
- 5. ALL WELDING SHALL CONFORM TO AWS D1.1 STRUCTURAL WELDING CODE, LATEST REVISION. ELECTRODES SHALL BE E70 SERIES.
- THE FABRICATOR SHALL BE RESPONSIBLE FOR THE DESIGN AND ADEQUACY OF ALL CONNECTIONS THAT ARE NOT FULLY DETAILED ON THE CONTRACT DRAWINGS.
- 7. ALL STEEL SHALL BE FINISHED AS NOTED ON ARCHITECTURAL DRAWINGS
- 8. ALL BEAMS, EXCEPT CANTILEVER BEAMS, SHALL BE FABRICATED & FRECTED WITH NATURAL CAMBER UP. ALL CANTILEVER BEAMS, STALL BE FABRICATED SO THAT THE NATURAL CAMBER UP. ALL CANTILEVER BEAMS SHALL BE FABRICATED SO THAT THE NATURAL CAMBER RAISES THE CANTILEVER END.
- 9. DETAILED FABRICATION SHOP DRAWINGS SHALL BE SUBMITTED FOR APPROVAL FABRICATION SHALL NOT PROCEED UNTIL SHOP DRAWINGS ARE APPROVED
- 10. CONTRACTOR SHALL PROVIDE ALL NECESSARY TEMPORARY GUYING AND BRACING REQUIRED TO ERECT AND HOLD THE STEEL FRAME IN ALIGNMENT AND COLUMNS PLUMB, UNTIL DECK AND WALLS ARE IN PLACE.
- 11. BEARING ENDS TO COLUMNS SHALL BE MILLED TO COMPLETE TRUE BEARING.
- 12. PROVIDE HOLES AS REQUIRED TO RECEIVE MISCELLANEOUS DETAILS INDICATED OF
- 13. OXYGEN CUTTING OF STRUCTURAL STEEL IS NOT ALLOWED IN THE FIELD EXCEPT WIT THE WRITTEN CONSENT AND APPROVAL OF THE ENGINEER.

#### **DESIGN LOADS**

- 1. DESIGN LOADS SHALL CONFORM TO THE FOLLOWING:
- NEW YORK STATE BUILDING CODE, 2020, WITH AMENDMENTS INTERNATIONAL BUILDING CODE (IBC) 2020 ASCE 7-16 MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES.
- 2. LIVE LOAD:

1ST FLOOR 100 PSF/2,000 LB. (KITCHEN, DINING, VESTIBULE, CORRIDORS)

3. SNOW LOAD

GROUND SNOW LOAD

SNOW LOAD DRIFT AND UNBALANCED LOADS PER ASCE 7-16

CATEGORY I EXPOSURE "B

BASIC WIND SPEED 115 MPH

5. SEISMIC LOAD:

STRUCTURAL RISK CATEGORY: II SITE CLASS "D" le = 1.0 Sds = 0.232 g

Sd1 = 0.108 d SEISMIC DESIGN CATEGORY "C"

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CD/WDM



**TOWN OF BLOOMING GROVE** 

LASSER PARK SENIOR CENTER

NEW YOR

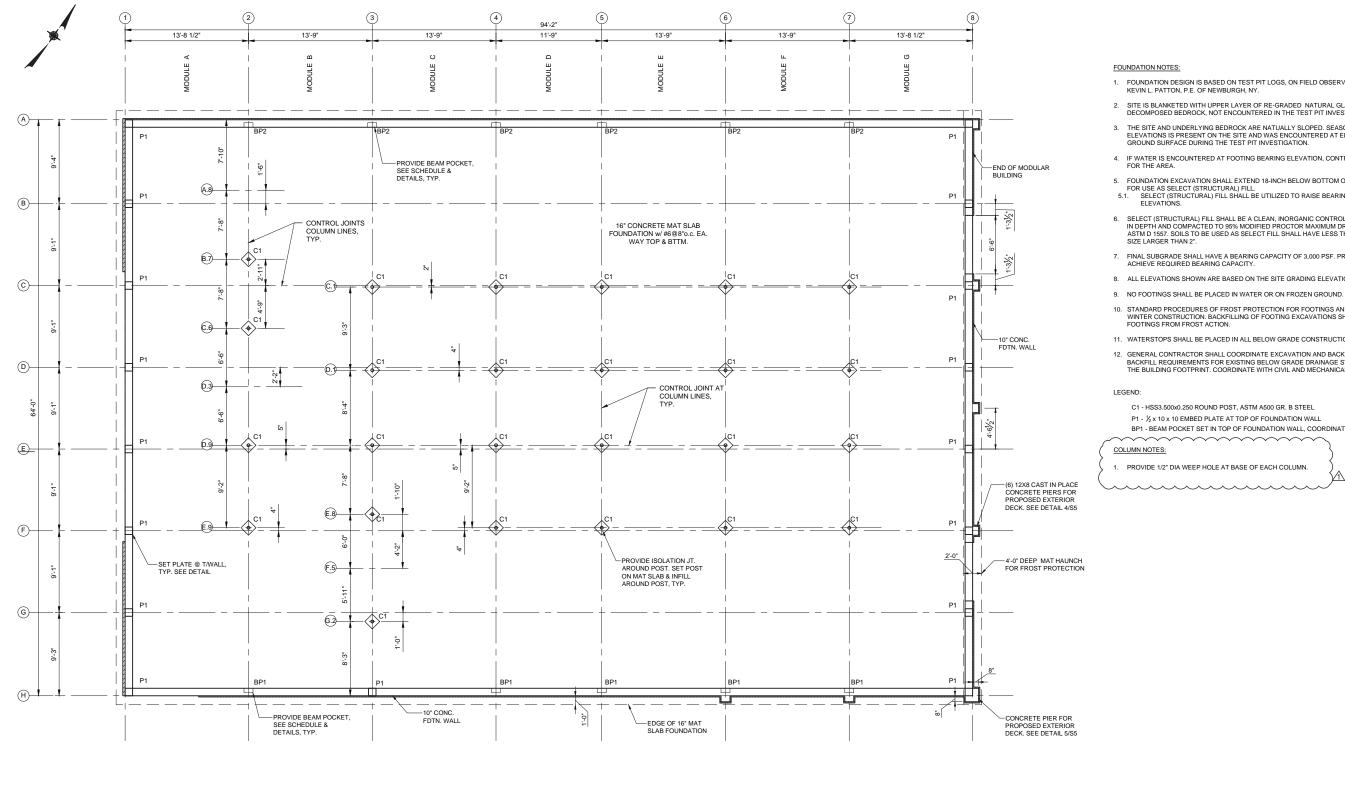
STRUCTURAL AND FOUNDATION NOTES

**CONTRACT 1 - STRUCTURAL FOUNDATIONS** 

5708 JUNE 2022

N.T.S.

STRUCTURAL



#### FOUNDATION NOTES:

- 1. FOUNDATION DESIGN IS BASED ON TEST PIT LOGS, ON FIELD OBSERVATIONS, AND GEOTECHNICAL REPORT PREPARED BY KEVIN L. PATTON, P.E. OF NEWBURGH, NY.
- SITE IS BLANKETED WITH UPPER LAYER OF RE-GRADED NATURAL GLACIAL TILL, COMPOSED OF SANDY GRAVEL WITH SILT. DECOMPOSED BEDROCK, NOT ENCOUNTERED IN THE TEST PIT INVESTIGATION, UNDERLIES THE GLACIAL TILL LAYER.
- THE SITE AND UNDERLYING BEDROCK ARE NATUALLY SLOPED. SEASONAL GROUNDWATER FROM RUNOFF AT HIGHER ELEVATIONS IS PRESENT ON THE SITE AND WAS ENCOUNTERED AT ELEVATIONS RANGING FROM 4'-8" TO 5'-6" BELOW GROUND SURFACE DURING THE TEST PIT INVESTIGATION.
- 4. IF WATER IS ENCOUNTERED AT FOOTING BEARING ELEVATION, CONTRACTOR SHALL PROVIDE DEWATERING MEASURES FOR THE AREA.
- FOUNDATION EXCAVATION SHALL EXTEND 18-INCH BELOW BOTTOM OF FOUNDATION. EXISTING SOIL SHALL BE REGRADED FOR USE AS SELECT (STRUCTURAL) FILL.
   SELECT (STRUCTURAL) FILL SHALL BE UTILIZED TO RAISE BEARING GRADE UP TO THE BOTTOM OF FOOTING ELEVATIONS.
- 6. SELECT (STRUCTURAL) FILL SHALL BE A CLEAN, INORGANIC CONTROLLED FILL, PLACED IN LIFTS NOT EXCEEDING 12 INCHES IN DEPTH AND COMPACTED TO 95% MODIFIED PROCTOR MAXIMUM DRY DENSITY AT OPTIMUM MOISTURE CONTENT PER ASTM D 1557. SOILS TO BE USED AS SELECT FILL SHALL HAVE LESS THAN 10% PASSING A #200 SIEVE WITH NO PARTICLE SIZE LARGER THAN 2".
- FINAL SUBGRADE SHALL HAVE A BEARING CAPACITY OF 3,000 PSF. PROOF-ROLLING SHALL BE UTILIZED AS REQUIRED TO ACHIEVE REQUIRED BEARING CAPACITY.
- 8. ALL ELEVATIONS SHOWN ARE BASED ON THE SITE GRADING ELEVATIONS PROVIDED ON THE CIVIL DRAWINGS.
- 10. STANDARD PROCEDURES OF FROST PROTECTION FOR FOOTINGS AND FOOTING EXCAVATIONS SHALL BE USED FOR WINTER CONSTRUCTION. BACKFILLING OF FOOTING EXCAVATIONS SHALL BE DONE AS SOON AS POSSIBLE TO PROTECT FOOTINGS FROM FROST ACTION.
- 11. WATERSTOPS SHALL BE PLACED IN ALL BELOW GRADE CONSTRUCTION JOINTS
- 12. GENERAL CONTRACTOR SHALL COORDINATE EXCAVATION AND BACKFILL REQUIREMENTS WITH ALL TRADES, INCLUDING BACKFILL REQUIREMENTS FOR EXISTING BELOW GRADE DRAINAGE STRUCTURES SLATED TO BE REMOVED FROM UNDER THE BUILDING FOOTPRINT. COORDINATE WITH CIVIL AND MECHANICAL DRAWINGS.

#### LEGEND:

- C1 HSS3.500x0.250 ROUND POST, ASTM A500 GR. B STEEL
- BP1 BEAM POCKET SET IN TOP OF FOUNDATION WALL, COORDINATE WITH STEEL FRAME & FOUNDATION DETAILS

#### COLUMN NOTES:

PROVIDE 1/2" DIA WEEP HOLE AT BASE OF EACH COLUMN

3/16"=1'-0"

7/25/22 ADDENDA #1

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**TOWN OF BLOOMING GROVE** 

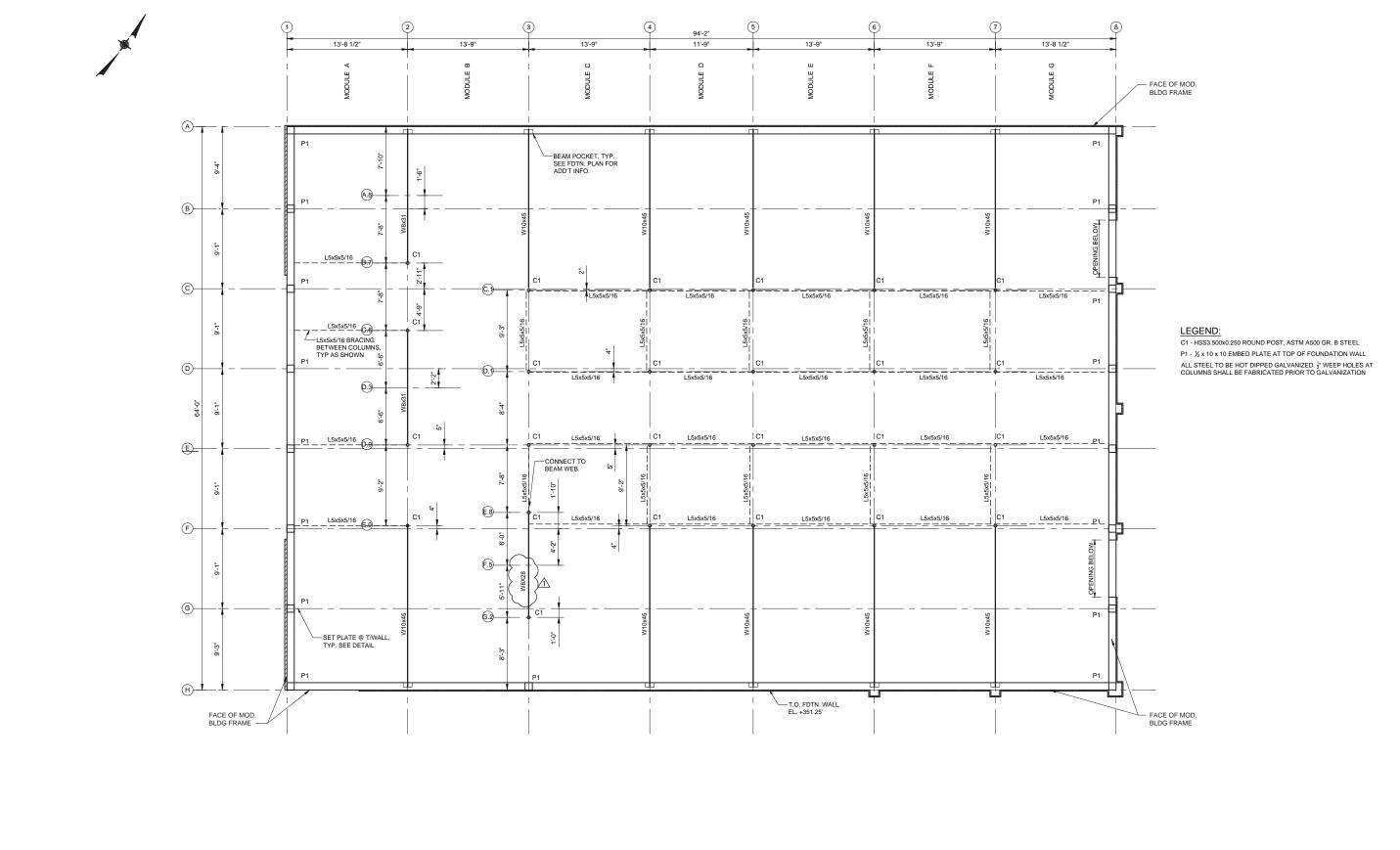
LASSER PARK SENIOR CENTER

NEW YORK

**MODULAR BUILDING FOUNDATION PLAN** STRUCTURAL

**CONTRACT 1 - STRUCTURAL FOUNDATIONS** 

5708 JUNE 2022





7/25/22 ADDENDA #1

NO. DATE

REVISION

INT.

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PROJECT ENGINEER: DRAWN BY:
AE MD

DESIGNED BY: CHECKED BY:
MD CD/WDM



	TOWN OF BLOOMING GROVE	
E COUNTY		NEW YORK

LASSER PARK SENIOR CENTER

MODULAR BUILDING
BASE RAIL SUPPORT PLAN
STRUCTURAL

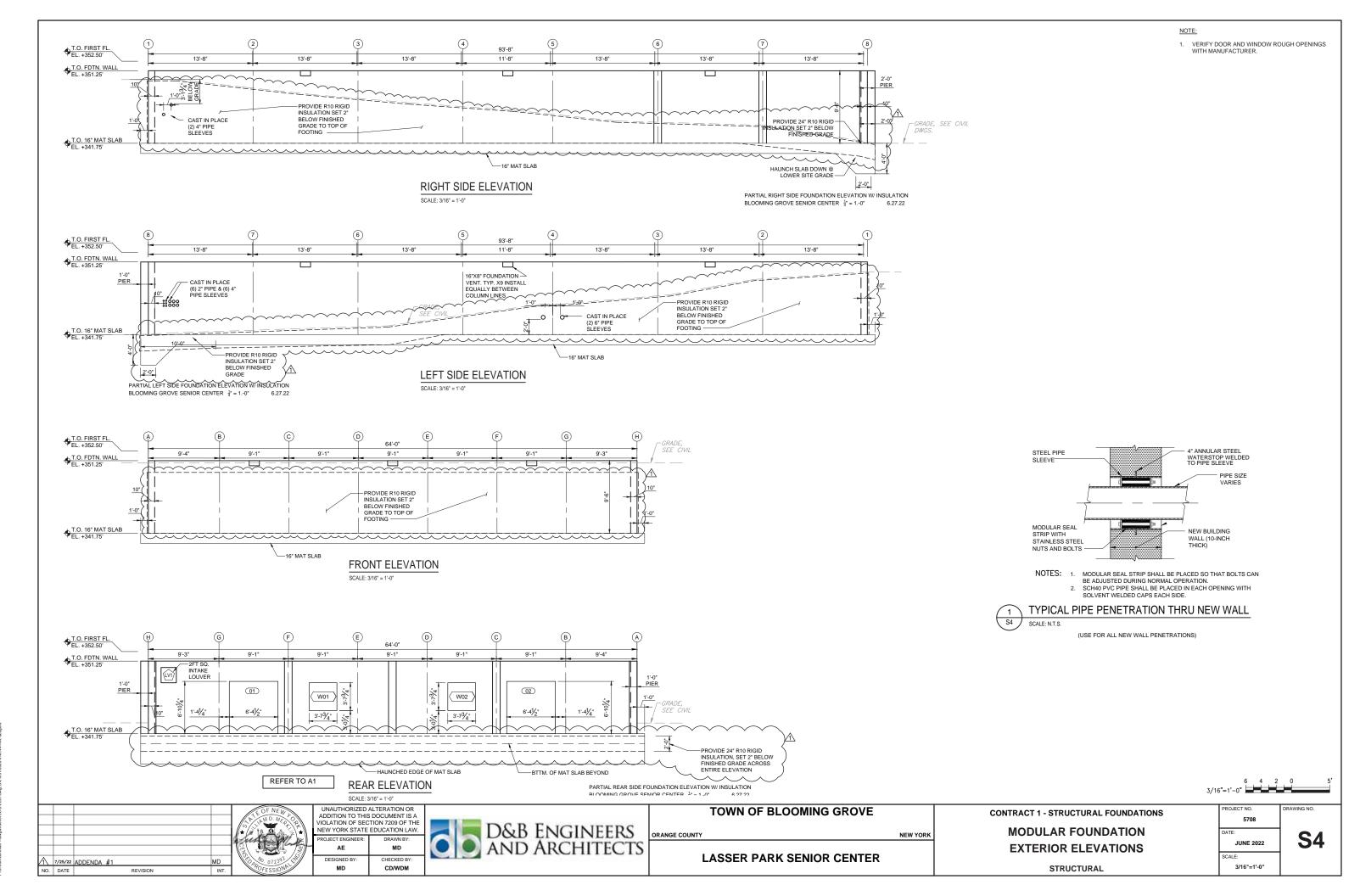
**CONTRACT 1 - STRUCTURAL FOUNDATIONS** 

PROJECT NO.
5708

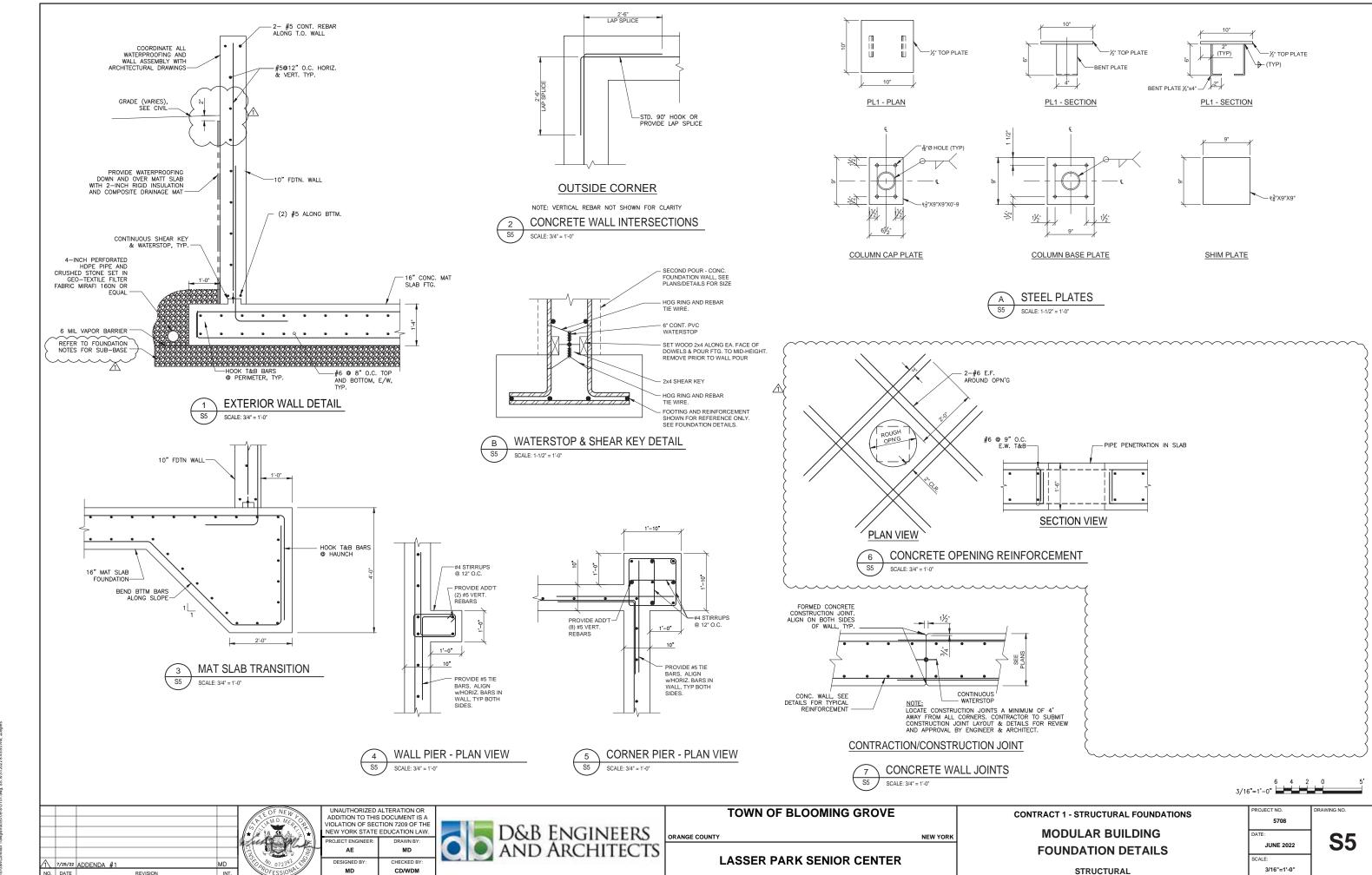
DATE:
JUNE 2022

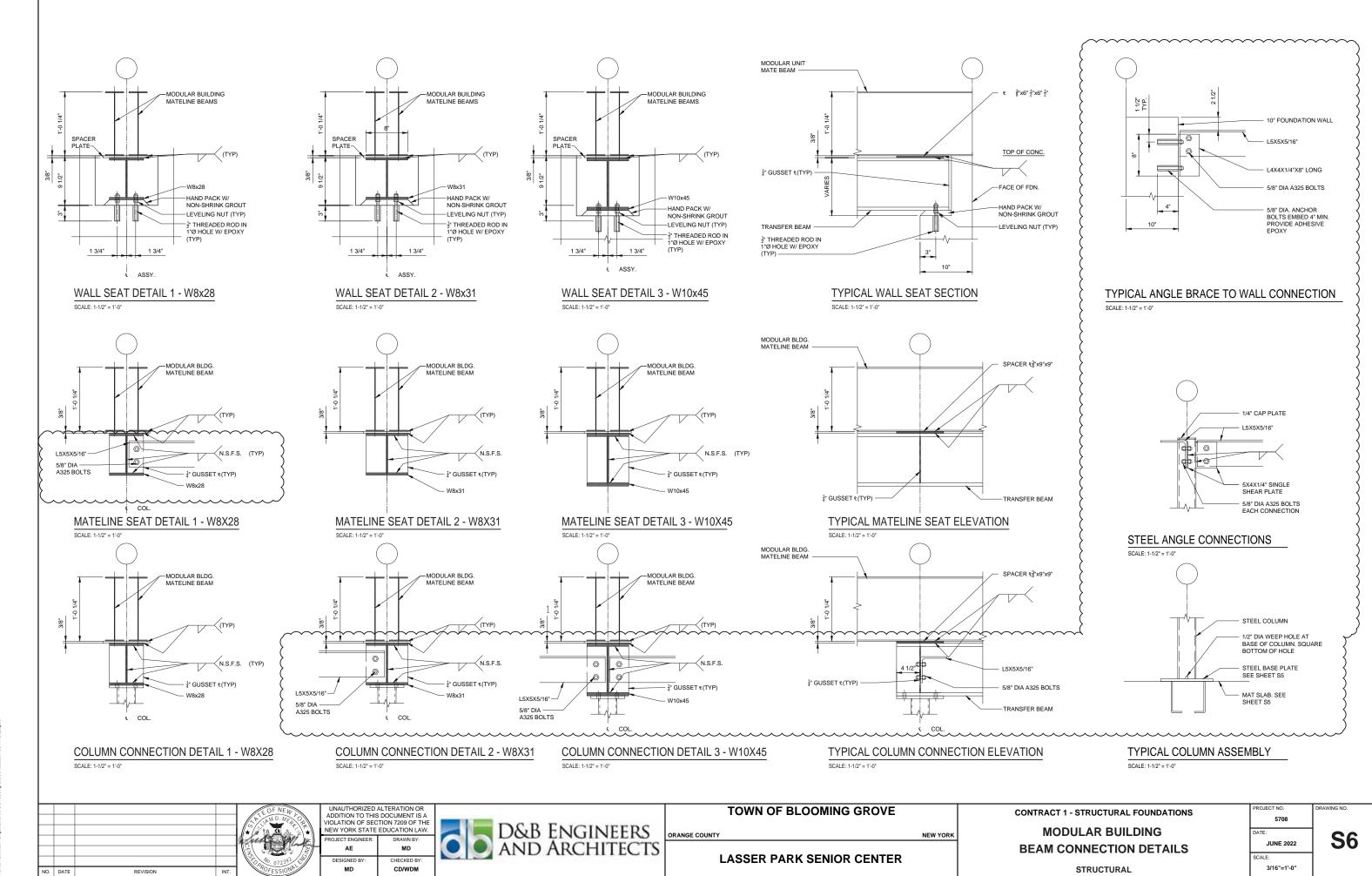
SCALE:
3/16" = 1'-0"

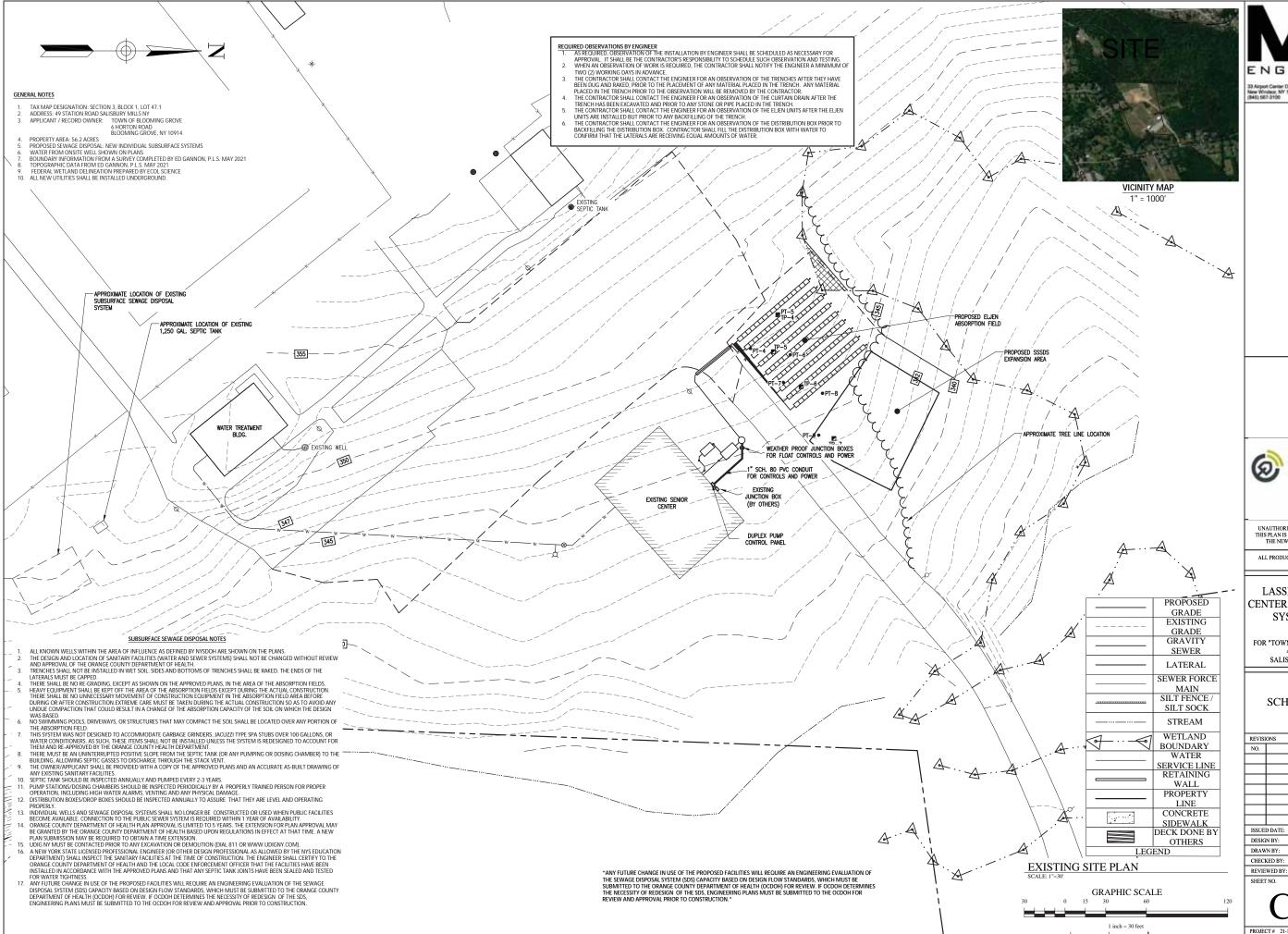
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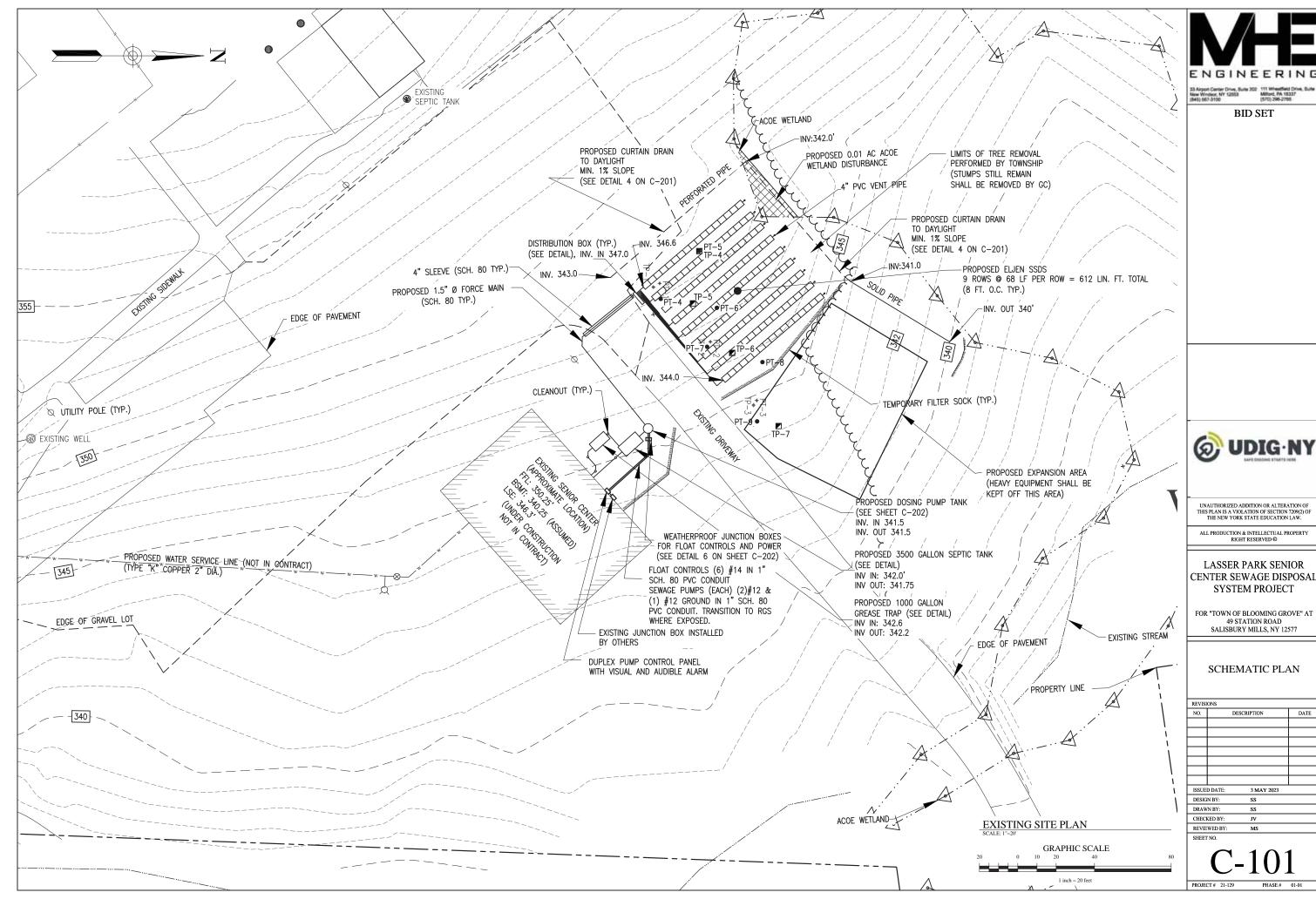
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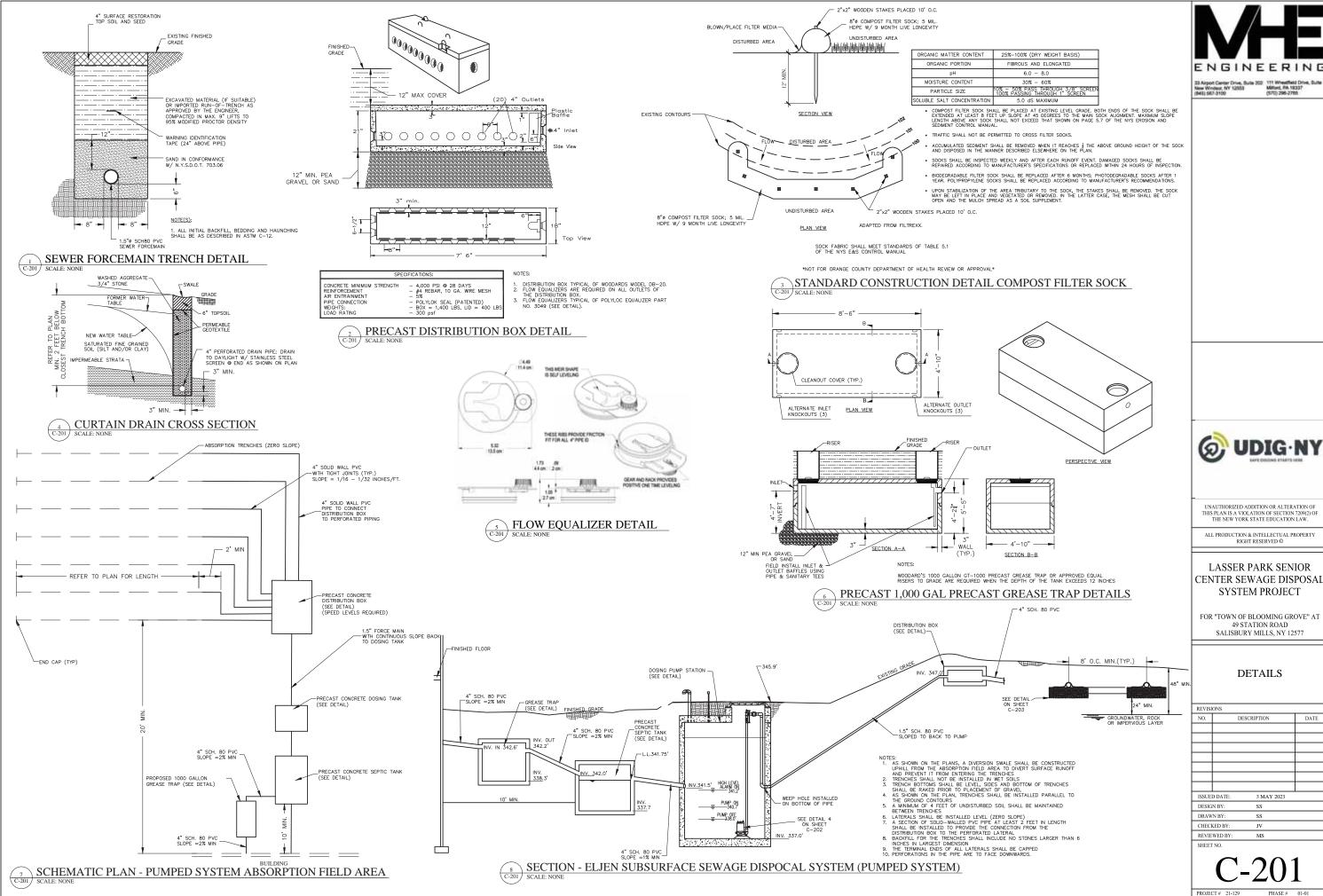
LASSER PARK SENIOR CENTER SEWAGE DISPOSAL SYSTEM PROJECT

FOR "TOWN OF BLOOMING GROVE" AT 49 STATION ROAD SALISBURY MILLS, NY 12577

SCHEMATIC PLAN

DESCRIPTION DATE 3 MAY 2023 SS JV





3 MAY 2023

SS

g: 111 Wheeffeld Dri Millord, FA 18337 (S70) 296-2765

#### NEW YORK STATE DESIGN STANDARDS FOR INTERMEDIATE SIZED WASTEWATER TREATMENT SYSTEMS

TABLE B-2 MINIMUM HORIZONTAL DISTANCE (IN FEET)

Existing Feature	Watertight Septic Tank	Sewer Line	Absorption Field or Unlined Sand Filter (Including Replacement Area)	Absorption Field Located in Gravel Soils (Including Replacement Area)	Seepage Pits (Including Replacement Ares)
Required Mi	simum Horizo	ntal Separ	ution Distances p	er Public Health	Law
Drilled Well - Public water system <sup>4</sup>	100	50	200	200	200
Drilled Well - Private water system	50	50	100	200	1,50
Water Line (Pressure)*	10	10	10	10	10
Rec	ommended Mi	olmum He	erizontal Separati	on Distances	
Water Line (Suction)	50	50	100	100	150
Dug Well / Spring	75	50	150	200	150
Surface Water *	50	28	100	100	100
Reservoir (water supply) - Private *	.50	50	100	100	100
Reservoir (water supply) – Public*	100	100	200	200	200

\*Refer to Public Health Law Part 5-1, Appendices 5-B & 5-D

Refer to Public Health Law Part 5-1, Appendix 5-8

"Refer to Public Health Law Part 5-1, Appendix 5-A

When wastewater treatment avenems are located un-enalised and in the direct path of surface mostly to a well, the clinest part of the treatment system should be at least 200 feet away from the well.

"If there is a direct discharge to surface water, use the Surface Water separation distances; if a water supply use the Reservoir (water supply) dotunces.

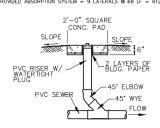
"Refer to local watershed roles and regulations for possible supersiding specifications

Interceptor Drain/Open Drainage	25	25	50**	50 11	5011
Diversion to Groundwater					
Stormwater Infiltration Management Practice	25	25	50 10	50"	5011
Stormwater Management Practice Discharging to Surface Water <sup>19</sup>	50	25	100	100	300
Culvert (Tight Pipe)	25	10	35	35	35
Culvert Opening	25	25	50	50	50
Catch Basin	25	N/A	50	50	50
Swimming Pool In Ground	20	10	35	35	.50
Foundation	10	N/A	20	20	20
Property Line	10	10	10	10	10
Top of Embankment	25	25	59	50	50
Wetland (NYSDEC)	100	100	100	100	100

SEPTIC SIZING CALCULATIONS
FLOW CALCULATIONS
FLOW CALCULATIONS
SENIOR CENTER = 95 PEOPLE \* 20 GPD/ PERSON = 1900 GPD
SUMMER CAMP = 30 PEOPLE \* 20 GPD/PERSON = 600 GPD
OFFICE = B PEOPLE \* 15 GPD/ PERSON = 120 GPD
TOTAL FLOW, Q = 2620 \* 0.8 (WATER SAVING FIXTURES) = 2096 GPD

TANK CAPACITY REQUIRED = 1.5 x 2,096 GAL = 3144 GAL TANK CAPACITY PROVIDED = 3500 GAL

REQUIRED ABSORPTION SYSTEM = 583 LINEAR FEET OF ELJENS PROVIDED ABSORPTION SYSTEM = 9 LATERALS @ 68 LF = 612 LF OF ELJENS TOTAL



PERCOLATION TESTS 24 HR. PRESOAK 10/25/22, RAN 10/26/22

7-4 (24" DEPTH) 9:17 12:25 14:00 14:17	1. 2. 3.	(24" DEPTH) 5:10 8:00 10:25 10:30	1. 2. 3. 4. 5. 6. 7.	6 (24" DEPTH) 5:20 9:20 16:05 18:32 22:04 24:03 27:43 28:12	1. 2.	7 (24" DEPTH) 4:15 5:20 5:13	1. 2.	8 (24" DEPTH) 4:27 5:20 5:59	1. 2.	-9 (24" DEPTI 5:03 7:35 8:14
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DEEP PITS LOGGED 10/26/22

TP-4 (70" DEPTH)
0-4" BROWN TOPSOIL
4-33" BROWN SILTY LOAM
33-57" BROWN SILTY CLAY LOAM
33-57" BROWN SILTY CLAY LOAM
57-70" BROWN SILTY LOAM W. GRAVEL (25%)
NO GROUNDWATER, NO BEDROCK, MOTTLING @ 30"

TP-5 (78" DEPTH) 0-5" BROWN TOPSOIL 5-40" BROWN SILTY LOAM

40-78" BROWN SILTY SAND LOAM W/ GRAVEL (25%) NO GROUNDWATER, NO BEDROCK, MOTTLING @ 34'

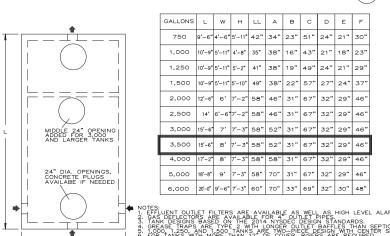
TP-6 (73" DEPTH)
0-6" BROWN TOPSOIL
6-59" BROWN SILTY CLAY LOAM
59-73" BROWN SILTY SANDY LOAM W/ GRAVEL
NO GROUNDWATER, NO BEDROCK, MOTTLING @ 32"

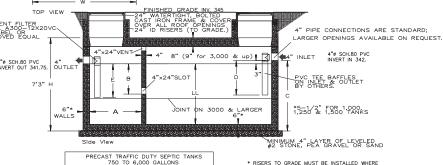
TP-7 (64" DEPTH) 0-5" BROWN TOPSOIL

5-64" BROWN SILTY LOAM W/ GRAVEL NO GROUNDWATER, NO BEDROCK, NO MOTTLING

		DEEP TEST RESULTS		
DEEP TEST 1	DEPTH RANGE	DESCRIPTION OF MATERIAL	LIMITING FACTORS	DEPTH
	0"-3"	TOP SOIL *SOIL TESTS PREFO	RMADERON 110/015/2021	
TOTAL DEPTH 76"	3"-32"	SILT LOAM WITH SOME COBBLES	BEDROCK NO	
	32"-52"	SANDY SILT LOAM	MOTTLING NO	
	52"-76"	SILT LOAM		
DEEP TEST 2				
	DEPTH RANGE	DESCRIPTION OF MATERIAL	LIMITING FACTORS	DEPTH
	0"-5"	TOP SOIL	WATER NO	
TOTAL DEPTH 64"	5"-47"	SILT LOAM WITH SOME GRAVEL	BEDROCK NO	
	47"-64"	SANDY SILT LOAM	MOTTLING YES	45"
DEEP TEST 3				
	DEPTH RANGE	DESCRIPTION OF MATERIAL	LIMITING FACTORS	DEPTH
	0"-5"	TOP SOIL	WATER NO	
TOTAL DEPTH 60"	5"-36"	SILT LOAM WITH SOME GRAVEL	BEDROCK NO	
	36"-60"	SANDY SILT LOAM WITH SOME GRAVEL	MOTTLING NO	

PERCOLATION TEST RESULTS					
TEST HOLE			RUN #	ELAPSED TIME	
TEST HOLE #	1		1	10: 41	
HOLE DEPTH	24	IN	2	13: 40	
HOLE DIAMETER	12	IN	3	15: 21	
			4	15: 56	
TEST HOLE #	2		1	12:25	
HOLE DEPTH	24	IN	2	16:04	
HOLE DIAMETER	12	IN	3	16:57	
TEST HOLE #	3		1	15: 35	
HOLE DEPTH	24	IN	2	16:47	
HOLE DIAMETER	12	IN	3	16:59	

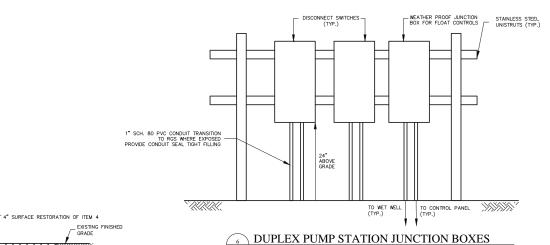


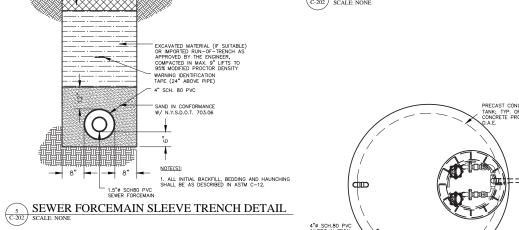


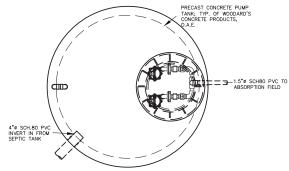
PRECAST TRAFFIC DUTY SEPTIC TANKS 750 TO 6,000 GALLONS
SPECIFICATIONS
CONCRETE MIN. STRENGTH: 4,000 PSI AT 28 DAYS
REINFORCEMENT: #4 & #5 REBAR / ASTM A615
AIR ENTRAINMENT: 6%
CONSTRUCTION JOINT: BUTYL RUBBER SEALANT
PIPE CONNECTION: POLYLOK SEAL OR AS NEEDED
LOAD RATING: HS20-44 + 30% / ASTM C857

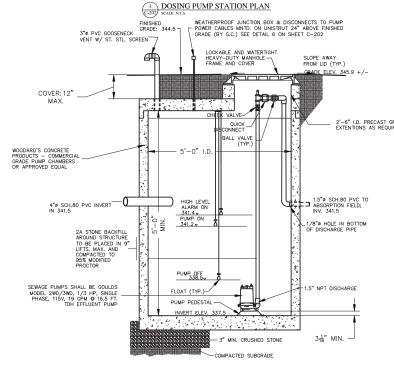
\* RISERS TO GRADE MUST BE INSTALLED WHERE DEPTH OF TANK IS BURIED GREATER THAN 12"

1 3500 GALLON PRECAST SEPTIC TANK
C-202) SCALE: N.T.S.









## 4 ALTERNATING DUPLEX DOSING PUMP STATION SECTION (200) SCALE NYS.

IES:

. TANK SHALL MEET ALL STANDARDS OF THE NEW YORK STATE DEPARTMENT OF HEALTH.

ALL CONSTRUCTION JOINTS AND PIPE CONNECTIONS SHALL BE WATERTIGHT.

PUMPS TO ALTERNATE AND ALARM TO SOUND IF ETHER PUMP FAILS TO CYCLE PROPERLY.

ALL APPLICABLE N.E.C. RECUREMENTS MUST BE WET.

USE TWO (2) GOULDS 200/3202 CAPABLE OF PUMPING 19 GPM AT 16.5 FEET OF TOTAL HEAD.

Millord, PA 18337 (570) 296-2765

BID SET

**WUDIG-NY** 

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LASSER PARK SENIOR CENTER SEWAGE DISPOSAL SYSTEM PROJECT

FOR "TOWN OF BLOOMING GROVE" AT SALISBURY MILLS, NY 12577

**DETAILS** 

REVISIONS ISSUED DATE 3 MAY 2023 DESIGN BY DRAWN BY: SS CHECKED BY: REVIEWED BY:

INTERMEDIATE CLEANOUT DETAIL

#### ELJEN DESIGN NOTES:

- 1. THIS DESIGN COMPLIES WITH AND MUST BE INSTALLED IN ACCORDANCE WITH THE MOST CURRENT ELJEN NEW YORK DESIGN AND INSTALLATION MANUAL.
- 2. THIS SYSTEM IS NOT DESIGNED FOR USE WITH A GARBAGE DISPOSAL.
- 3. THE SOIL MUST BE SCARIFIED TO PROVIDE DEEP CHANNELS FOR THE SAND. A PLOWED INTERFACE ON CONTOUR IS ALSO REQUIRED TO PREPARE THE SOIL FOR FILL PLACEMENT.
- 4. SCARIFY ANY SMEARED SUBSOIL PRIOR TO FILL PLACEMENT BY HAND RAKING.
- 5. FILL MATERIAL SHALL MEET OR EXCEED STATE OF NEW YORK CODE REQUIREMENTS. ALL FILL MATERIAL SHALL BE CLEAN BANK RUN SAND, FREE OF TOPSOIL, HUMUS AND "DREDGING" DIRECTLY BENEATH THE GSF SYSTEM.
- 6. ASTM C33 SPECIFIED SAND WITH LESS THAN 10% PASSING A #100 SIEVE AND LESS THAN 5% PASSING A #200 SIEVE SHALL BE PLACED BELOW AND AROUND THE GSF MODULES, WITH 6 INCHES MINIMUM UNDERNEATH AND 6 INCHES MINIMUM SURROUNDING THE GSF MODULES IN TRENCH CONFIGURATIONS.
- 7. ELJEN PROVIDED GEOTEXTILE COVER FABRIC SHALL PROVIDE PROPER TENSION AND ORIENTATION OF THE FABRIC AROUND THE SIDES OF THE PERFORATED PIPE ON TOP OF THE GSF MODULES. FABRIC SHOULD BE NEITHER TOO LOOSE, NOR TOO TIGHT. THE CORRECT TENSION OF THE COVER FABRIC IS SET BY:

  SPREADING THE COVER FABRIC OVER THE TOP OF THE MODULE AND DOWN BOTH SIDES OF THE MODULE WITH THE COVER FABRIC TENTED OVER THE TOP OF THE PERFORATED DISTRIBUTION PIPE.
- DISTRIBUTION PIPE.

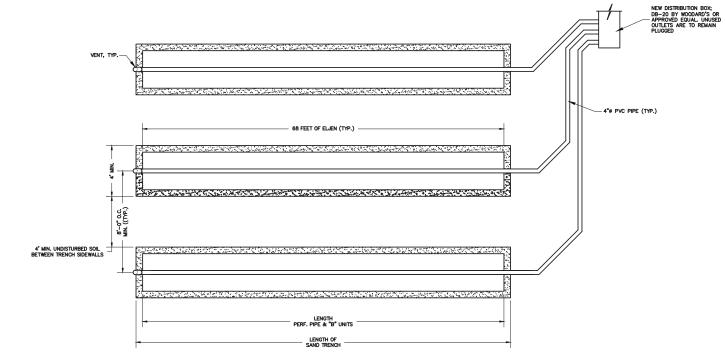
  PLACE SHOVEL FULL'S OF SPECIFIED SAND DIRECTLY OVER THE PIPE AREA ALLOWING THE

  COVER FABRIC TO FORM A MOSTLY VERTICAL ORIENTATION ALONG THE SIDES OF THE PIPE.

  REPEAT THIS STEP MOVING DOWN THE PIPE.
- BACKFILL MATERIAL SHALL BE CLEAN WITH NO ROOTS OR STONES LARGER THAN 2 INCHES IN ANY DIMENSION TO A MINIMUM DEPTH OF 8 INCHES OVER THE GSF MODULES AND FINAL COVER FOR VEGETATION OF 4 INCHES TO 6 INCHES OF CLEAN LOAM.
- ANY SYSTEM WHICH IS MORE THAN 18 INCHES BELOW FINISH GRADE AS MEASURED FROM THE TOP OF THE MODULE SHALL BE VENTED WITH PVC PIPING TO THE SURFACE AT THE DISTANT END OF ALL ELJEN LATERALS.

#### ELGEN TRENCH INSTALLATION SIZING AND GUIDELINES:

- 1. ENSURE ALL COMPONENTS LEADING TO THE GSF SYSTEM ARE INSTALLED PROPERLY. SEPTIC TANK FFFLUENT FILTERS ARE REQUIRED WITH THE GSF SYSTEM.
- 2. DETERMINE THE NUMBER OF GSF MODULES REQUIRED USING THE TRENCH SIZING EXAMPLE.
- 3. PREPARE THE SITE. DO NOT INSTALL A SYSTEM ON SATURATED GROUND OR WET SOILS THAT ARE SMEARED DURING EXCAVATION. KEEP MACHINERY OFF INFILTRATIVE AREAS.
- 4. PLAN ALL DRAINAGE REQUIREMENTS ABOVE (UP-SLOPE) OF THE SYSTEM. SET SOIL GRADES TO ENSURE THAT STORM WATER DRAINAGE AND GROUND WATER IS DIVERTED AWAY FROM THE ABSORPTION AREA ONCE THE SYSTEM IS COMPLETE.
- 5. EXCAVATE THE TRENCH; PREPARE THE RECEIVING LAYER TO MAXIMIZE THE INTERFACE BETWEEN THE NATIVE SOIL AND SPECIFIED SAND.
- ${\bf 6}.$  MINIMIZE WALKING IN THE TRENCH PRIOR TO PLACEMENT OF THE SPECIFIED SAND TO AVOID SOIL COMPACTION.
- 7. PLACE SPECIFIED SAND IN A 6" LIFT AND STABILIZE BY FOOT, A HANDHELD TAMPING TOOL OR A PORTABLE VIBRATING COMPACTOR. THE MINIMUM STABILIZED HEIGHT BELOW THE GSF MODULE MUST BE LEVEL AT 6" .
- 8. PLACE GSF MODULES WITH PAINTED STRIPE FACING UP, END TO END ON TOP OF THE SPECIFIED SAND
- 9. A STANDARD 4-INCH PERFORATED PIPE, SDR 35 OR EQUIVALENT, IS CENTERED ALONG THE MODULES 4-FOOT LENGTH. ORIFICES ARE SET AT THE 4 & 8 O' CLOCK POSITION.
- 10. ALL 4-INCH PIPES ARE SECURED WITH MANUFACTURERS SUPPLIED WIRE CLAMPS, ONE PER MODULE.
- 11. (PRESSURE DISTRIBUTION SYSTEMS) INSERT A PRESSURE PIPE (SIZE PER DESIGN AND CODE) INTO THE STANDARD 4-INCH PERFORATED PIPE. THE PRESSURE PIPE ORIFICES ARE SET AT THE 12 O' CLOCK POSITION AS SHOWN IN FIGURE 14. EACH PRESSURE LATERAL WILL HAVE A DRAIN HOLD AT THE 6 O' CLOCK POSITION. EACH PRESSURE LATERAL SHALL INCLUDE SWEEPING CLEANOUTS AT THE TERMINAL FINES AND THE ACCESSIBLE FRANCE PAID. ENDS AND BE ACCESSIBLE FROM GRADE.
- 12. COVER FABRIC SUBSTITUTION IS NOT ALLOWED. THE INSTALLER SHOULD LAY THE ELJEN PROVIDED GEOTEXTILE COVER FABRIC LENGTHWISE DOWN THE TRENCH, WITH THE FABRIC FITTED TO THE PERFORATED PIPE ON TOP OF THE GSF MODULES. FABRIC SHOULD BE NEITHER TOO LOOSE, NOR TOO TIGHT. THE CORRECT TENSION OF THE COVER FABRIC IS SET BY:
- A. SPREADING THE COVER FABRIC OVER THE TOP OF THE MODULE AND DOWN BOTH SIDES OF THE MODULE WITH THE COVER FABRIC TENTED OVER THE TOP OF THE PERFORATED DISTRIBUTION PIPE.
- B. PLACE SHOVELFULS OF SPECIFIED SAND DIRECTLY OVER THE PIPE AREA ALLOWING THE COVER FABRIC TO FORM A MOSTLY VERTICAL ORIENTATION ALONG THE SIDES OF THE PIPE. REPEAT THIS STEP MOVING
- 13. PLACE THE SAND EXTENSIONS ALONG BOTH SIDES OF THE MODULES EDGE. A MINIMUM OF 6 INCHES OF SPECIFIED SAND IS PLACED AT THE BEGINNING AND END OF EACH TRENCH.
- 14. COMPLETE BACKFILL WITH A MINIMUM OF 12 INCHES OF CLEAN POROUS FILL MEASURED FROM THE TOP OF THE MODULE. BACKFILL EXCEEDING 18 INCHES REQUIRES VENTING AT THE FAR END OF THE TRENCH. USE WELL GRADED NATIVE SOIL FILL THAT IS CLEAN, POROUS AND DEVOID OF LARGE ROCKS. DO NOT USE WHEELED EQUIPMENT OVER THE SYSTEM. A LIGHT TRACK MACHINE MAY BE USED WITH CAUTION, AVOIDING CRUSHING OR SHIFTING OF PIPE ASSEMBLY.
- 15. DIVERT SURFACE RUNOFF FROM THE SYSTEM. FINISH GRADE TO PREVENT SURFACE PONDING. TOPSOIL AND SEED SYSTEM AREA TO PROTECT FROM EROSION



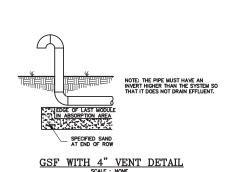
2. SAND SPECIFICATION SHALL CONFORM TO ASTM C33.

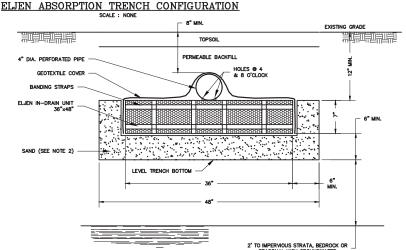
4. DO NOT INSTALL TRENCHES IN WET SOIL. THRENCH BOTTOMS AND SIDES SHALL BE RAKED TO ELIMINATE SMEARED OR SEALED SOILS PRIOR TO INSTALLATION OF SAND.

5. IF THE ELJEN MODULES ARE PLACED 18" DEEP OR MORE THEY MUST BE VENTED WITH 4" PVC PIPE TO THE SURFACE TO ALLOW AIR FLOW INTO THE SYSTEM.

ELJEN IN-DRAIN CROSS SECTION

3. THE ENDS OF ALL LATERALS SHALL BE CAPPED.





ELJEN INSTALLATION NOTES: 1. DISTRIBUTION PIPES SHALL BE INSTALLED WITH PIPE PERFORATIONS FACING DOWN

TO ENSURE PROPER SYSTEM OPERATION, THE SYSTEM MUST BE INSTALLED USING ASTM C33 SAND WITH LESS THAN 10% PASSING A #100 SIEVE, AND LESS THAN 5% PASSING A #200 SIEVE. NSTALLERS MUST REQUEST A SIEVE ANALYSIS FROM THEIR MATERIAL SUPPLIER TO ENSURE THAT THE SPECIFIED SAND THAT THEY ARE PURCHASING FOR USE DURING INSTALLATION OF THE ELIJEN GSF SYSTEM MEETS THE SPECIFIED ASTM C33 SAND REQUEMENTS LISTED

SIEVE SIZE



BID SET

(C) UDIG-NY

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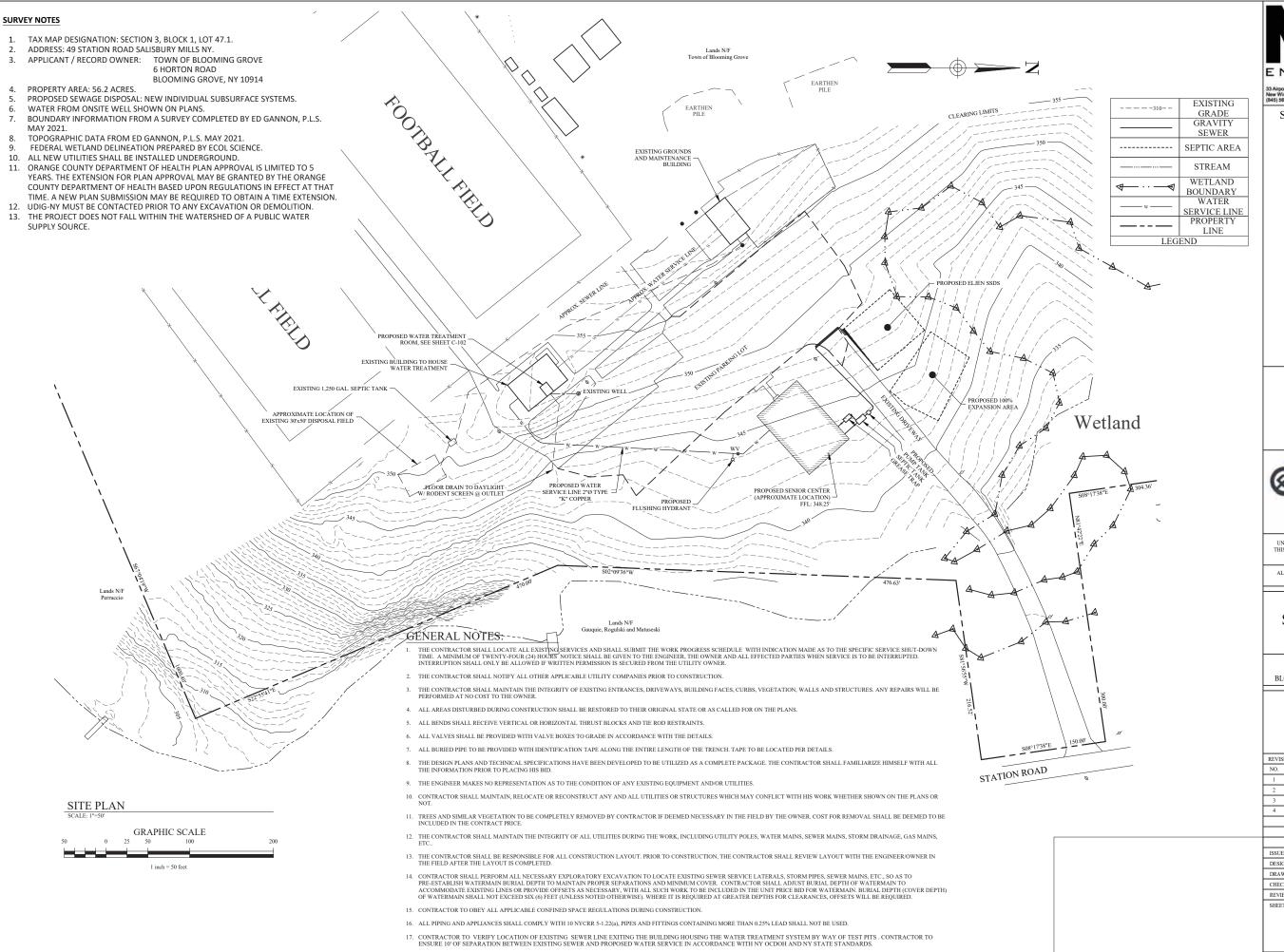
ALL PRODUCTION & INTELLECTUAL PROPERTY RIGHT RESERVED  $\ensuremath{\mathbb{Q}}$ 

LASSER PARK SENIOR CENTER SEWAGE DISPOSAL SYSTEM PROJECT

FOR "TOWN OF BLOOMING GROVE" AT 49 STATION ROAD SALISBURY MILLS, NY 12577

DETAILS

REVISIONS 3 MAY 2023 DESIGN BY DRAWN BY SS CHECKED BY: REVIEWED BY: SHEET NO



33 Airport Center Drive, Suite 202 111 Wheatfield Dr New Windsor, NY 12553 Milford, PA 18337 (845) 567-3100 (570) 296-2765

SCHEMATIC DESIGN

(C) UDIG-NY

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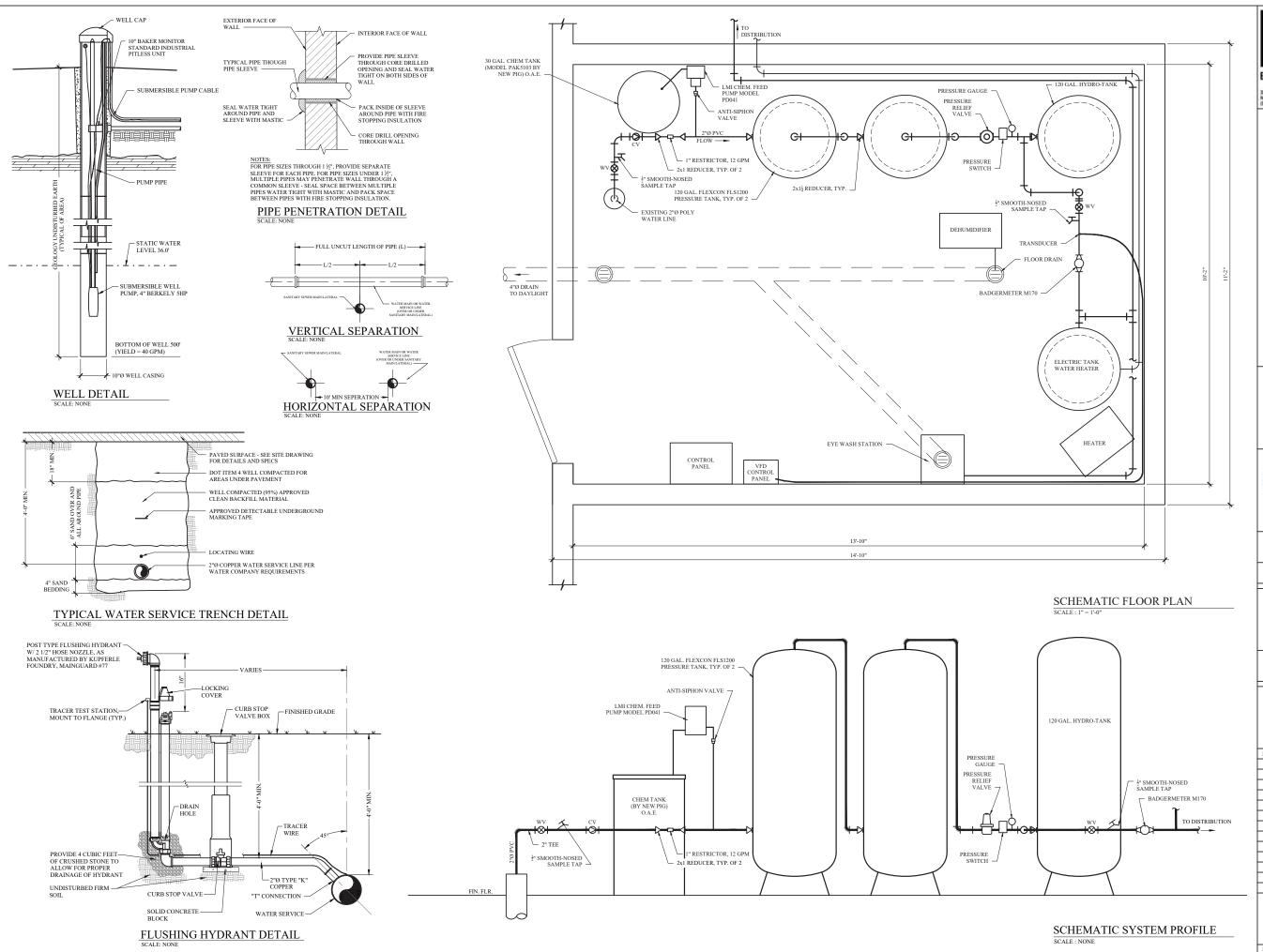
LASSER PARK SENIOR CENTER

TOWN OF BLOOMING GROVE BLOOMING GROVE, NEW YORK 10914

> WATER SYSTEM SITE PLAN

REVISIONS			
NO. DESCRIPTION		DATE	
1	REVISED PER OCHD COMMENTS	9-08-2022	
2	REVISED PER OCHD COMMENTS	12-27-2022	
3	REVISED PER OCHD COMMENTS	1-10-2023	
4	REVISED PER OCHD COMMENTS 2-10-23	2-23-23	

ISSUED DATE:	21, JAN. 2022	
DESIGN BY:	JV	
DRAWN BY:	HPBJr, SS	
CHECKED BY:	JV	
REVIEWED BY:	JV	



ENGINEERING

33 Asport Cerese Drive, Butte 200 111 Wreathed Dries, B New Window, NY 12653 Millord, PA 15337 (570) 296-2765 SCHEMATIC DESIGN



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# LASSER PARK SENIOR CENTER

TOWN OF BLOOMING GROVE 6 HORTON ROAD BLOOMING GROVE, NEW YORK 10914

#### WATER SYSTEM SCHEMATIC FLOOR PLAN

REVISIONS			
NO.	DESCI	RIPTION	DATE
1	REVISED PER O	CHD COMMENTS	9-08-2022
2	REVISED PER O	CHD COMMENTS	12-27-2022
3	REVISED PER OCHD COMMENTS		1-10-2023
4	REVISED PER OCHD COMMENTS 2-10-23		2-23-23
ISSUED DATE:		21, JAN. 2022	
DESIGN BY:		JV	
DRAWN BY:		HPBJr, SS	
CHECKED BY:		JV	
REVIEWED BY:		JV	
SHEET NO.			

C-102

## APPENDIX III

## ORANGE AND ROKLAND UTILITIES



# Project 20220620206 - Lasser Park Senior Center Orange and Rockland Distribution Engineering Inspection Policy

**Note:** All contractors responsible for the above-referenced installation, including electricians and civil/site contractors, are expected to become familiar with the project red book package, to the extent necessary to perform their work in accordance with Orange and Rockland requirements. This includes knowledge of all relevant installation details, as well as any directions provided by Distribution Engineering on the customer one line diagram and site plan.

# 1 Number and Scope of Inspections

Three inspections will be required for this installation. Corresponding checklists have been included in the project red book package, and are labeled as follows:

Trench and Riser Pole Inspection Checklist

Transformer Pad and Ground Grid Inspection Checklist

Final Inspection Checklist

# 2 Initiating a Request for an Inspection

Notice to Distribution Engineering of a site being ready for inspection is to be made by sending the applicable checklist to either the fax number or email address provided therein. The checklist is to be signed by the party requesting inspection, with a phone number and current date.

An automated response will be sent to the party submitting the checklist, upon receipt by Distribution Engineering.

The typical timeframe for inspection is three business days from the date the checklist is received, for checklists submitted prior to Noon on a given business day.

Notification will be made on site, or by phone or email to the contact provided on the checklist, of the outcome of the inspection. All excavations and grounding installations are to remain open until notice of satisfactory inspection has been given.

# 3 Inspection Fees

For each required inspection, the first visit to the site to review and approve the installation will be performed at no charge.

If the installation does not meet one or more of the requirements of the particular inspection being requested, as a result of noncompletion or noncompliance with the applicable details and/or direction provided by Distribution Engineering, the installation will be deemed to have failed inspection. A repeat inspection fee will be assessed for

# Project 20220620206 - Lasser Park Senior Center Orange and Rockland Distribution Engineering Inspection Policy

each subsequent site visit necessary for Distribution Engineering to verify all checklist items have been completed as required.

The fee for each repeat inspection is \$120.00, payable by check or money order, to Orange and Rockland. Repeat inspection fees are to be mailed to:

Orange and Rockland Utilities Attn Distribution Engineering 390 W NY Rt 59 Spring Valley, NY 10977

Please include the ORU project number for reference.

### 4 Additional Information

Common reasons for failed inspections for a project of this scope include, but are not limited to, the following:

# **Trench and Riser Pole Inspection:**

- Trench, or portions thereof, closed prior to receiving ORU approval to backfill
- Premature inspection as a result of the riser pole not having yet been installed
- Inadequate depth of primary conduit as a result of a site not being within 6 inches of final grade

# **Transformer Pad and Ground Grid Inspection:**

- Pad formed, or precast pad set, prior to the site being within 6 inches of final grade
- Grading around the pad is not leveled as instructed on the customer site plan
- Shallow ground grid
- Ground grid not placed at a 12-inch offset from the transformer pad perimeter
- Bollards and/or curbs not in place

# Project 20220620206 - Lasser Park Senior Center Orange and Rockland Distribution Engineering Inspection Policy

- Insufficient clearance from edge of pad to other underground facilities

# **Final Inspection:**

- Secondary connections to transformer spades made without using the hardware specified in the applicable detail
- Cable is not coiled and supported at the top of the 10-foot riser pipe

If there are any questions regarding this notice, or the requirements outlined in the project red book package, site plan or one line diagram reviewed by ORU, please contact Distribution Engineering at <a href="mailto:Distributionengineering@oru.com">Distributionengineering@oru.com</a> or 845-577-3388, prior to beginning the project. Thank you for your time and cooperation.

I have read this notice and	l understand the inspection policy for this	project.
Signature:	Date:	
Name:		
Company:		
Phone:		
Email:		

Please return this completed form to Orange and Rockland by fax to 914-925-6804 or by email to Distributionengineering@oru.com prior to requesting the first inspection. Thank you.



# PROJECT 20220620206

# THREE PHASE PADMOUNTED TRANSFORMER INSTALLATION

Lasser Park Senior Center
49 Station Rd
Salisbury Mills NY 12577

Orange and Rockland Utilities, Inc.

One Blue Hill Plaza

Pearl River, New York 10965

#### THIS PACKAGE CONTAINS:

# APPLICABLE SECTIONS OF THE MOST RECENT EDITION OF RED BOOK SPECIFICATIONS FOR RESIDENTIAL AND NON-RESIDENTIAL PADMOUNTED TRANSFORMER INSTALLATIONS

#### 15 KV MATERIAL LIST

TRENCH AND RISER POLE INSPECTION CHECKLIST

TRANSFORMER PAD AND GROUND GRID INSPECTION CHECKLIST

FINAL INSPECTION CHECKLIST

NUMBER OF PAGES: 44

#### NOTE:

THIS PACKAGE IS INTENDED TO ASSIST THE CUSTOMER WITH THE INSTALLATION OF AN ELECTRICAL SERVICE THAT IS COMPATIBLE WITH ORANGE AND ROCKLAND'S DISTRIBUTION SYSTEM. THE CUSTOMER IS RESPONSIBLE FOR AN INSTALLATION THAT MEETS THE REQUIREMENTS OF THE LATEST VERSION OF THE NATIONAL ELECTRIC CODE (NEC), THE NATIONAL ELECTRICAL SAFETY CODE (NESC), AND THE LOCAL AUTHORITY HAVING JURISDICTION.

These specifications, which protect the mutual interests of the Customer and the Company, will be revised or amended as required in keeping with developments and progress of the industry. The latest revisions should always be used. Additional copies of this booklet and any revisions thereof may be obtained at the Company's Field Offices. Previous editions are outdated and invalid. Revisions are denoted by an arrow in the left margin.

This document (Red Book), the General Specifications for Electric Installations (Blue Book) and the Electric Meter Approved Equipment List can also be found on the Company's website at oru.com/contractorresources.

#### **New Construction Services Field Offices:**

Projects will be coordinated through the New Construction Services Field Offices at one of the following locations:

Blooming Grove 500 Route 208 Monroe, NY 10950 Telephone Number Fax Number	(845) 577-3324 (845) 783-5504
Middletown 71 Dolson Avenue Middletown, NY 10940 Telephone Number	(845) 577-3324 (845) 342-8939
Mahwah One Lethbridge Plaza Suite 32 – Second Floor, Route 17 North Mahwah, NJ 07430 Telephone Number Fax Number	(845) 577-3324 (201) 327-4521
Spring Valley Operations Center 390 West Route 59 Spring Valley, NY 10977 Telephone Number Fax Number	(845) 577-3324 (845) 577-3319

### **Call Before You Dig**

For your safety and protection, the Utility Notification Service provides details on the location of underground electric wires, gas lines and communication cables. This service is provided to reduce the risk of personal injury, prevent damage to underground facilities, and avoid unnecessary repair costs and fines. Before you dig, please call:

#### **Underground Utilities Call Center of New York:**

#### 811

NY Code 753 requires 2-10 working days' notice.

## **Garden State Underground of New Jersey:**

#### 811

NJ Code requires 3-10 working days' notice.

#### For Gas Emergencies Call:

911 or 800-533-LEAK (5325).

### **High Voltage Proximity Clearances:**

When work will take place in proximity to overhead high voltage lines, you have the responsibility of notifying the utility in writing at least five (5) normal working days before the job is scheduled. If the notification is made by regular postal mail, allow for ample delivery time to ensure the notice is received prior to the five (5) working day deadline. All correspondence for **Orange and Rockland Utilities, Inc. and Rockland Electric Company** is to be directed to your **New Construction Services Field Office**.

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ABBREVIATIONS:			
<ul> <li>N.E.C National Electrical Code, NFPA 70, Latest Edition</li> <li>N.E.S.C National Electrical Safety Code, ANSI C2, Latest Edition</li> <li>UL - Underwriter's Laboratory</li> <li>EPR - Ethyl Propylene Rubber</li> </ul>			

#### SPECIFICATIONS

#### FOR

#### RESIDENTIAL AND

#### NON-RESIDENTIAL

#### TRANSFORMER INSTALLATIONS

## I. INTRODUCTION

This supplement provides specifications for customers\* requesting electric service from the Company to be supplied to a single phase or three phase padmounted transformer installation. It applies to a normal installation served by a single underground primary feeder circuit from an overhead line. Installations requiring dual feeders, multiple transformers, primary or secondary switchgear, switching or emergency generators must be referred to the Company's Engineering Department for recommendations and approval. Manufacturer's equipment drawings for installations, not normally covered in this specification, must be submitted to the Company's Engineering Department prior to fabrication or construction. (See Section III of these specifications for details).

Information concerning the service location, route of the primary service lateral and other data applicable to the specific installation will be furnished by the Company's New Construction Services Representative who will obtain technical data from the Engineering and Operating Departments. For this purpose, the customer must furnish four prints of the final site plan with approval by the governmental authorities having jurisdiction, showing underground utilities (drains, sewers, etc.) and roads, either existing or proposed. Also, the customer must provide a drawing showing sufficient detail to locate doors, windows, fire escapes, etc., either existing or proposed, in the area of the requested service location. Specific information

furnished by the Company shall be subject to change if significant changes are made in the design or scheduling of the project by the customer. These requirements do not cover the customer's complete electrical installation design, but are concerned only with those items in which the customer, his consulting engineer, electrical contractor, equipment manufacturer and the Company have a mutual interest. When supplemental information is required, the customer shall direct all inquiries and correspondence to New Construction Services Representative who is coordinating the installation.

#### II. DEFINITIONS

- Company means Orange and Rockland Utilities, Inc., and Subsidiaries.
- Cost or Expense shall include all labor, material and other applicable charges, including overheads required for the work to be performed by Company personnel.
- Customer is used to designate either a present or a prospective user of the Company's electric service.
- Electrical Installation refers to the total electrical wiring and equipment installed on the customer's premises.
- Ground is a conducting connection between an electric circuit or equipment and earth, or some conducting body which serves in place of the earth.
- Hertz is cycles per second of an alternating current supply.
- 7. Line is a system of poles, wires and equipment, or the equivalent below grade ducts, conduits, cables, etc., used for the distribution of electricity. It may be located above or below ground on/in a street, highway, alley or on a private right-of-way.

- 8. Multiple-Occupancy Building is a structure (including row houses) enclosed within exterior walls of fire walls built, erected, and formed of component structural parts and designed to contain two or more individual dwelling or commercial units for permanent occupancy.
- Power Quality is the concept of powering and grounding sensitive equipment in a manner that is suitable to the operation of that equipment.
- Recommended means desired, but not mandatory.
- 11. Service means the conductors and equipment for delivering energy from the Company's distribution line to the wiring system of the premises served.
  - A) Service drop refers to that portion of the overhead conductors between the Company's distribution line and the first point of attachment on the customer's facilities.
  - B) Service entrance conductors from an overhead system are the conductors between the terminals of the customer's service equipment and a point, outside the building, where joined by connection to the service drop.
  - C) Service entrance conductors from an underground system are the conductors between the meter and the customer's service equipment.
  - D) Service equipment is the necessary customer owned equipment, usually consisting of a circuit breaker or switch and fuses, and their accessories, located near the point of entrance of supply conductors to a building or other structure, or an otherwise defined area, and intended to constitute the main control and means to cutoff electric supply. See Figure 12.
  - E) Service lateral is a system of underground conductors and equipment for delivering electricity from the Company's designated connection point of the distribution line to the first point of connection to the premise wiring.

- F) Service point from an overhead system is the point of connection between the facilities of the Company and the first point of connection to the premise wiring.
- G) Service point from an underground system is the point of connection between the service lateral and the first point of connection to the premise wiring.
- 12. Shall is defined as mandatory in nature.
- 13. Short-term service is a service which is recurrent in nature for short periods each time, either periodically each year, intermittently during the year or at other irregular intervals.
- 14. Should is defined as desirable in nature, as contrasted with mandatory.
- 15. Temporary service is a non-recurring service intended to be used for a short time only, such as for construction or exhibit purposes, etc. The temporary facilities will be removed at such time as permanent service is provided or no longer required.

# III. CODES, STANDARDS AND WIRING ADEQUACY

The customer's electric service equipment and its installation shall be in accordance with the latest Company Standards for the Installation, the latest edition of the National Electrical Code (N.E.C.), National Electrical Safety Code (N.E.S.C.) and all applicable ordinances and codes. When differences in Company Specifications or Standards or Governmental ordinances or Codes occur, the more stringent requirements shall govern the installation. Any deviation from the preceding must be approved by the Electrical Engineering Department(s) of the Company and other agencies having jurisdiction over the installation.

Responsibility for design and construction in conformance with all codes rests with the owner. If the customer does not follow the above codes and standards, the customer will be expected to make any necessary changes at his expense before service is provided.

#### IV. APPROVAL AND INSPECTIONS

The customer must submit his plans to the Company before ordering equipment or starting work to insure that the proposed design for the installation conforms to Company requirements. The customer must furnish, for review by the Company, information as follows:

- A. Manufacturer's equipment drawings for the installation; showing electrical one-line diagrams and characteristics of protective equipment, when applied; physical arrangement and clearances; and particularly, the installation details for metering transformers.
- B. Manufacturer specifications for manual or automatic electrical transfer switches when proposed to be installed.
- C. A final approved site plan drawing showing all underground utilities (drains, sewer, gas, electric, etc.) roads and requested service entrance location. Also, a drawing showing sufficient detail to locate doors, window, fire escapes, etc., either existing or proposed in the vicinity of the requested service location.

Fabrication of equipment or project construction should not proceed without approvals from the Company and other agencies having jurisdiction.

The Company requires inspections of the primary service installation, for which inspection checklists will be provided. At the completion of each portion of the installation, the customer/contractor is to submit the respective checklist using the contact information provided therein, and an inspection will be arranged.

For each inspection checklist issued and submitted properly, the Company will perform the initial inspection at no charge. Where repeat inspections are necessary because of non-compliance or non-completion, a repeat inspection fee will be assessed to the responsible party. Further details will be provided with the project specification.

In addition to the Company inspections, it is the customer's responsibility to arrange for inspection by the Board of Fire Underwriters or the authority having jurisdiction. Before service can be provided, the customer will furnish a certificate of satisfactory evidence as to the safe condition of their wiring.

#### III. SCOPE OF CUSTOMER WORK

The customer shall provide all materials (unless otherwise specified), labor and equipment required for completion of the installation as specified herein and as called for in the drawings or as directed by the Company's authorized engineering representative. The customer shall include items incidental to the work not specifically mentioned herein so as to make the finished work fully complete and satisfactory in every respect.

In general, the customer's work will consist of the following major items, and the specific notations with respect to these shall apply:

Installation or construction of the following:

- A. 1. Transformer pad
  - 2. Duct or conduit work
  - Grounding
  - \*4. Primary cable installation (including terminations)
  - \*5. Secondary cable installation (including connections)
  - 6. Metering
- B. Excavation and backfill
- C. Grading

# VI. TRANSFORMER PAD LOCATION

The customer shall provide property and necessary rights-of-way (where applicable) on which to construct the transformer foundation. The location should be mutually agreed upon by the Company and the customer. It shall be located between 4'-0" and 10'-0" off an approved drivable surface (e.g., asphalt, concrete, grass-crete pavers, etc). The location shall also be in accordance with the applicable Figure and the following minimum horizontal clearances from other underground facilities:

- A. 20' 0" from any fuel storage facility (above ground included).
- B. 10' 0" from gas meter regulators, water pipes (wells included) and any other liquid filled pressurized pipe.
- C. 5' 0" from non-pressurized pipes (e.g., storm drains, sewer, etc.)
- D. 5' 0" from gas services and communication cables.

<sup>\*</sup> For all residential customers, primary terminations and secondary connections will be completed in the transformer by the Company.

SPECIAL NOTE FOR RESIDENTIAL CUSTOMERS: THE TRANSFORMER PAD MUST BE LOCATED BETWEEN 4'-0" AND 10'-0" OF THE ACTUAL DRIVEWAY LEADING TO THE HOUSE OR BARN. THE SHORT SIDE OF THE BOX MUST FACE TOWARDS THE DRIVEWAY.

## VII. TRANSFORMER FOUNDATION

The customer shall install, own and maintain the pad foundation for the transformer. It is to be constructed according to the latest Company Standards for the installation.

NOTE: AT TIME OF PAD INSPECTION & IF APPLICABLE, CURBS & BOLLARDS

AROUND THE TRANSFORMER PAD AREA MUST BE IN AT TIME OF

INSPECTION. AND, WITH OR WITHOUT CURBS OR BOLLARDS, THE PAD SITE

MUST BE WITHIN 6" OF FINAL GRADE.

#### VIII. TRENCH AND CONDUIT WORK

The customer shall furnish, own (unless otherwise specified), install and maintain all duct and conduit associated with the transformer installation in accordance with the applicable Figures. The primary and secondary conduits shall enter the transformer installation as per the applicable Figure. All conduits are to be installed according to the latest N.E.C. and N.E.S.C. requirements. Underground primary conduits shall have a minimum cover as specified in the applicable Figures.

When paralleling water and sewer utilities all underground electric conductors/conduit(s) shall have a minimum horizontal clearance of ten (10) ft. from a water or sewer line and one (1) ft. separation when crossing.

Spare conduits (when applicable) must be capped or plugged and a corrosion-resistant pull line of 200 pounds (minimum) breaking strength shall be installed in conduits until needed. Metallic pull wires are not acceptable.

# Riser Pole Requirements; Where a Customer's underground service (0 – 34,500 volts) "rises" on a:

- A) Company distribution pole with a DELTA primary circuit voltage (2400 volts or 4800 volts), the customer installed service <u>riser conduit and 90 degree long radius sweep shall be UL approved non-metallic rigid Schedule 80 PVC conduit.</u> The Customer is also required to install a UL approved PVC conduit coupling at the top of the conduit riser. Customer installed below grade <u>metallic</u> conduits shall not be closer than twenty-five (25') feet from the base of the pole.
- B) Company distribution pole with a WYE primary circuit voltage (2400/4160 volts or 7620/13200 volts or 19920/34500 volts), the customer installed riser conduit(s) and 90 degree long radius sweep(s) shall be UL approved: rigid galvanized steel conduit, or intermediate metal conduit, or Schedule 80 rigid nonmetallic PVC conduit. The Customer is also required to install a UL approved PVC conduit coupling that will connect to the Company's Schedule 40 rigid nonmetallic PVC conduit. Also See Note 1 below.

NOTE 1: The minimum acceptable radius of a below grade two (2") inch diameter, 90 degree bend at any "rising" location is 24 inches. All riser conduit bends are to be of the long radius sweep design and must be installed to these specifications.

NOTE 2: The minimum radius of 90 degree\* bends at the riser pole and transformer pad entries is 36" for 15kV, 48" for 35kV construction and must be installed to these specifications.

NOTE 3: The riser pole conduit must extend up the pole a distance of ten feet (10') above final grade elevation at the base of the pole. The Company will complete the conduit installation on the riser pole.

The remaining conduit between the 90° bend and the transformer installation must be of the same size, be either UL approved rigid galvanized steel conduit (only if the Company's distribution system voltage is of a WYE configuration), UL approved Schedule 40 or 80, color gray, PVC conduit or UL and Company approved fiberglass conduit. Any individual couplings installed in a conduit system must provide a completely smooth surface with no gaps or ridges between the conduits.

The minimum conduit sizes, utilizing the primary cables discussed in Section X of this specification, are as follows:

- 1. Two inches (2") for one conductor, 15KV construction.
- 2. Four inches (4") for one conductor, 35KV construction.
- 3. Four inches (4") for two conductors, 15KV or 35KV construction.
- 4. Four inches (4") for three conductors, 15KV construction.
- Six inches (6") for three conductors, 35KV construction.

Secondary conduit size and quality are to be determined by the customer load, site conditions and the latest edition of the N.E.C.

Secondary conduit size and quantities are to be determined by the customer's load, site conditions and the latest edition of the N.E.C. THE MAXIMUM NUMBER OF CONDUCTORS IN ANY GIVEN CONDUIT SHALL

# NOT EXCEED FOUR (4), NO EXCEPTIONS.

## IX. GROUNDING

The customer shall furnish, own (unless otherwise specified), install and maintain a ground grid consisting of No. 2/0 AWG bare str., tinned copper with 5/8" x 8'-0" long copperweld ground rods as shown on the applicable Figures. The ground grid installation is to be at 18" below final grade elevation. All below grade UL listed connectors to the ground rods are to be made with a Amp Wrench-Lok connectors, cadwelds or thermoweld process, "Ampact Fired On" connectors or compression connectors that have been approved by the Company's Distribution Engineering Department. Two N.E.C. and N.E.S.C. approved grounding connections shall be provided by the customer to terminate the ground cable pigtails at the transformer grounding pads.

For metallic primary conduits at a riser pole (two maximum), the customer shall provide (unless otherwise specified) and install a No. 2 AWG (minimum) 600 volt insulated copper conductor to the N.E.C. and N.E.S.C. approved conduit grounding clamp(s). Conductor shall be a minimum of five (5) feet long for the Company to make the interconnection to the Company installed ground rod.

For metallic primary transformer pad entrance conduit(s), they shall be grounded in the same manner as the riser pole conduit(s) except the conduit(s) shall be grounded to the transformer ground wire conductor (not a ground rod) with No. 2 AWG 600 volt insulated copper conductor and shall be in accordance with the appropriate Company Standards. N.E.C. and N.E.S.C. approved grounding

connections shall be provided and installed by the customer to terminate the conduit ground wires at the transformer ground conductor. Grounding of metallic secondary conduit(s), at a transformer pad entrance, shall be made by the customer in the same manner as the primary metallic conduit(s) and be in accordance with the latest edition of the N.E.C., N.E.S.C. and Company Standards.

Any metallic primary or secondary conduits (two maximum) at a riser pole, shall be grounded with a minimum of No. 2 AWG 600 volt insulated copper conductor. The customer shall supply and install approximately five (5) feet of No. 2 AWG bare str. copper to their metallic conduit(s) with N.E.C. approved conduit clamp(s). The Company will complete the connection to the Company installed 5/8" x 8'-0" copperweld ground rod.

When two or more pieces of equipment are installed within 10 Ft. of each other, all ground grids must be bonded together with Company and N.E.C. approved connectors.

#### X. PRIMARY CABLE

The customer shall furnish, install, own and maintain the primary cable installation, unless the customer qualifies for the Company's 091 Procedure. This applies only to New Jersey customers. See the attached Section XVIII and your New Construction Services Representative for specific details. The customer shall determine the cable length required for the installation, allowing additional cable for equipment such as a riser pole, transformer, junction box, switch pad or manhole.

All primary cables are to be manufactured and tested to meet the latest requirements of Insulated Cable Engineers Associated (ICEA), and Association of

Edison Illuminating Companies (AEIC) No. CS6-87, and appropriate Company specifications for 15KV or 35KV cable.

For 13.2GRY/7.62KV voltage, the primary cable shall be 15KV rated, shielded, 175 mils EPR insulation, have a full concentric neutral and an overall semi-conducting polyethylene jacket, with three (3) equally spaced extruded red stripes. The minimum conductor size, dependant upon the customer's load, is #2 AWG Aluminum. Cable is to be Kerite URD (SPS-HTK), or Okonite Okoguard URD-J, or approved equivalent.

For 34.5/19.9KV voltage, the primary cable shall be 35KV rated, shielded, 345 mils of EPR insulation, have a full concentric neutral and an overall semi-conducting polyethylene jacket, with three (3) equally spaced extruded red stripes. The minimum conductor size, dependant upon the customer's load is #1/0 AWG aluminum. Cable is to be Kerite URD (SPS-HVK), Okonite Okoguard URO-J, or approved equivalent. Any deviation from the above must be approved by the Distribution Engineering Department.

Manufacturer's specifications for proposed cables must be submitted to Orange and Rockland Utilities, Inc., Distribution Engineering Department, for review and written approval prior to purchase and installation to insure compatibility with the Company's distribution system.

All cable ends must be sealed at all times and resealed when cut to prevent contamination of the cable by moisture and dirt. An appropriate heat shrink seal is recommended.

Jacketed concentric neutral primary cable is to be installed direct buried, or in metallic conduit (for Grounded WYE systems only) or in non-metallic PVC conduit according to the latest N.E.C., N.E.S.C. or Company requirements.

For direct buried installations, a 2" sand padding is to be installed below the primary cable and 6" of sand is to be installed above the primary cable installation, the full width of the trench. If required by the N.E.C. or N.E.S.C., a 2" x 12" planking is to be placed on top of the sand padding and centered over the cable. The trench is to be backfilled to grade elevation, as referenced to the applicable Figures.

### XI. PRIMARY CABLE TERMINATIONS

The customer shall furnish (unless otherwise specified) all primary cable termination kits designed to fit the installed primary cable system.

The customer shall install the primary cable termination material at the transformer when such work does not come within the Company's Labor Union responsibility. The Company's New Construction Services Representative will inform the customer when this work is the responsibility of the Company.

When service is provided from an underground distribution system, the customer must consult the Company for the proper terminations. Also, it is the customer's responsibility to consult with the Company for the type of equipment designed for the job (for example, live front vs. dead front) so that appropriate material may be obtained to complete the job on schedule.

The termination's at the riser pole or at <u>live front</u> equipment must be <u>outdoor type</u> stress cones.

For 15KV primary cable -

3M Co. Cat. No. 7642-S-2-2 or Company approved equivalent for #2 AWG conductor.

For 35KV primary cable -

3M Co. Cat. No. 5646-1/0 or Company approved equivalent for #1/0 AWG conductor.

The terminations at a <u>dead front</u> padmount transformer or equipment are to be load break type cable terminations. For customer owned equipment, the customer must also furnish primary bushing well inserts that are compatible with the elbow connector.

The terminations at dead front equipment and dead front padmount transformers shall be:

For 15KV primary cable - (\*)

Elastimold Loadbreak Elbow,
Cat. No. 166LR-A-5220 or Company approved equivalent for #2 AWG conductor;
Elastimold Bushing Well Inserts,
Cat. No. 1601A4;
Elastimold Grounded Protective
Dead End Cap(s) when required, Cat.
No. 160-DRG; or Company approved

equivalents.

For 35KV primary cable - (\*)

Elastimold Loadbreak Elbow,
Cat. No. 376LR-K-240 or Company approved equivalent for #1/0 AWG conductor;
Elastimold Bushing Well Insert, Cat. No. 3701A4; Elastimold Dead End Insulating Cap(s) when required,
Cat. No. 370DRG; or Company approved equivalents.

(\*) For prevention of dirt and moisture contamination to the cable, cable sealing kits are required to be installed with Elastimold primary cable elbow terminations. 15KV sealing kits for #2 - #2/0 AWG conductor are to be 3M Co. Cat. No. 8452; 35KV sealing kits for #I/O AWG conductor are to be 3M Co. Cat. No. 8453 or Company approved equivalents.

The terminations and bushing well inserts must be approved by the Company's Distribution Engineering Department for the specific installation.

The Company will install the primary cable termination kits at the Company's connection point; that is, riser pole, junction box, padmount equipment, or manhole. The kits are to be delivered to the appropriate New Construction Services Field Office at least 48 hours prior to the scheduled installation date.

It is the customer's responsibility to properly identify the primary cables on all ends in accordance with the latest issue of the N.E.C.

Upon completion of the primary cable installation for secondary metered customer's, the Company will high potential test each new primary cable. For primary metered customer's, it's the customer's responsibility to have this test performed either by the Company or privately. If done privately, the Company must receive the test results prior to energization. These tests will be conducted from the customer's H.V. terminations at his service point (transformer, main switch equipment, primary meter, etc.) to the Company's connecting point, that is, riser pole, padmount equipment, junction box or manhole. The Company does not assume any responsibility for the cable and/or accessories which fail to pass the test. The Company will not energize the cables until they have passed the above test.

#### XII. SECONDARY CABLE AND BUS DUCT

The customer shall furnish, install, own and maintain the secondary cable installation. The customer's cable shall be insulated stranded cable terminated at the transformer with appropriate (N.E.C. approved) compression connectors. For

proper application to transformer terminals see the applicable Figure. The secondary cable installation is to conform to the latest edition of the N.E.C. and N.E.S.C. NOTE: THE MAXIMUM NUMBER OF CONDUCTORS SHALL NOT EXCEED FOUR (4) PER ANY GIVEN CONDUIT, NO EXCEPTIONS.

All bolted secondary wire connections to the transformer terminals are to be installed in accordance with the applicable Figure.

Secondary transformer terminals and connectors are to be insulated when electrical clearances are inadequate as determined by the Company's authorized engineering representative. See Section XIV for clearances.

Secondary feeders must include one neutral conductor in each occupied conduit.

The Company's padmount transformers are not designed for overhead secondary bus duct construction. If the customer intends to use secondary bus duct on secondary metered Company owned padmount transformers, the secondary service must enter the unit underground within the secondary area limits as defined in the applicable Figure.

The customer may elect to use overhead bus duct on primary metered installations with customer owned padmount transformers. In case of failure of this non-standard transformer, time for restoration of service by the Company, if called upon by the customer, will be extensive. The customer shall be responsible for the equipment design and maintenance of the electrical system.

#### XIII. METERING

# ALL METERING EQUIPMENT SHALL BE INSTALLED OUTDOORS UNLESS PRIOR APPROVAL IS GIVEN BY THE COMPANY.

## Secondary Metering 208Y/120V, 240/120V

The customer shall furnish, install, own and maintain a current transformer cabinet\* for secondary metered installations. Depending on the service size, the customer or the Company will install the current transformers in the C.T. cabinet and the Company will wire the secondary C.T. connections.

#### Secondary Metering 480Y/277V

The customer shall furnish, install, own and maintain a current transformer cabinet\* and voltage transformer cabinet\* according to the applicable Figures.

Depending on the service size, the customer or the Company will install the current transformers in the C.T. cabinet and voltage transformers in the V.T. cabinet.

\* Not required for services 200 amperes and below.

The Company will wire the secondary C.T. connections and the primary and secondary connections on the voltage transformers.

The Company will furnish the meter, current transformer(s) and voltage transformer(s) as required for the specific installation. The customer should arrange for a job meeting with the Company Metering Department through his New Construction Services Representative to determine locations, timing, and specific requirements for the metering installation.

NOTE: The customer will supply & install a Company approved meter pan and test block for a current transformer installation.

### Primary Metering

When primary metering information is required, the customer should direct all inquiries and correspondence to their New Construction Services Representative.

#### XIV. CLEARANCES

### Electrical Clearances for Primary Voltages

The normal electrical clearances of live parts for service equipment, other than standard manufactured metal-clad switchgear are given in the following tabulation.

Normal clearances shall be provided whenever practical.

Insulating barriers shall be provided between live parts and ground and between phases for live conductors and connectors when the tabulated clearances below cannot be obtained. The insulating barrier material shall have thickness and a dielectric value to withstand full phase to phase service voltage and shall have adequate arc, heat and flame resistance as well as adequate physical strength.

	Normal	Normal
	Phase-to-Ground	Phase-to-Phase
<u>KV</u>	Clearance	Clearance
5	2 ½"	5"
15	7 1/2"	13"
35	20"	35"

#### Electrical Clearances for Secondary Voltage

0-600V, minimum 2" phase-to-phase or phase-to-ground.

#### Physical or Safety Clearances

Refer to appropriate codes, regulations and standards including, but not limited to the following: Occupational Safety & Health (OSHA) regulations, latest editions of the N.E.C., N.E.S.C., High Voltage Proximity Acts and the Company Standards.

#### XV. ENERGIZATION PROCEDURE

The Company's Distribution Engineering Department will inspect each transformer upon notification that both the contractor / customer and the Company have completed the installation. Such notification should be initiated by the customer faxing in their Pre-Inspection Checklist and calling their New Construction Services Representative.

If the final transformer inspection is rejected by the Company's Distribution Engineering Department, the authorized engineering representative will notify the customer's representative of the corrective action required for approval of the installation. A reinspection of the installation will be conducted upon completion of the corrective action required.

Upon receipt of both the Company approval notice and the Underwriter Inspection Certificate\*, the installation will then be scheduled for energization by the Company.

\* Certificate of satisfactory evidence as to the safe condition of the wiring from the Authority having jurisdiction.

#### XVI. BACKFILL AND GRADING

The customer and/or contractor shall assume the responsibility of backfilling and grading the installation. Refer to the applicable Figure(s).

# XVII. SPECIFICATIONS FOR CONCRETE

#### A. Concrete Work

All concrete construction work shall be in accordance with the recommendation of the American Concrete Institute as stated in their Bulletin ACI 318, latest revision and as specified herein.

#### Materials

#### 1. Portland Cement:

Portland Cement shall conform to the latest edition of the "Standard Specification for Portland Cement" of the American Society for Testing Materials, Designation: C150, Type I, II and III.

#### Metal Reinforcement:

Wire for concrete reinforcement shall conform to the requirements of the "Standard Specifications for Cold-Drawn Steel Wire for Concrete Reinforcement, A.S.T.M.: A-82, latest edition, and the applicable Company specification.

## C. Concrete Quality

The equipment pads have been designed for concrete having a minimum ultimate comprehensive strength at 28 days of 3000# per square inch, and all concrete, except as otherwise noted or specified, shall be designed to meet or exceed this requirement.

All concrete exposed to weathering shall have a minimum air content as shown in A.C.I. 318, latest edition, Section 4.2.5.

# D. Forms and Details of Construction

Forms for all parts of the specified concrete work shall be so constructed that finished surfaces shall conform to the shape, size and dimensions as specified on the applicable Figure.

All forms are to be constructed and braced so that finished concrete surfaces shall be level, free from bulges, distortions or other variations.

Removal of forms shall be carried out in such a manner as to insure the complete safety and integrity of the structure. In no instance shall the supporting forms be disturbed or removed until the concrete has cured sufficiently to adequately support its own weight and any other expected construction load placed thereon.

# E. Concrete Finishing

# 1. General:

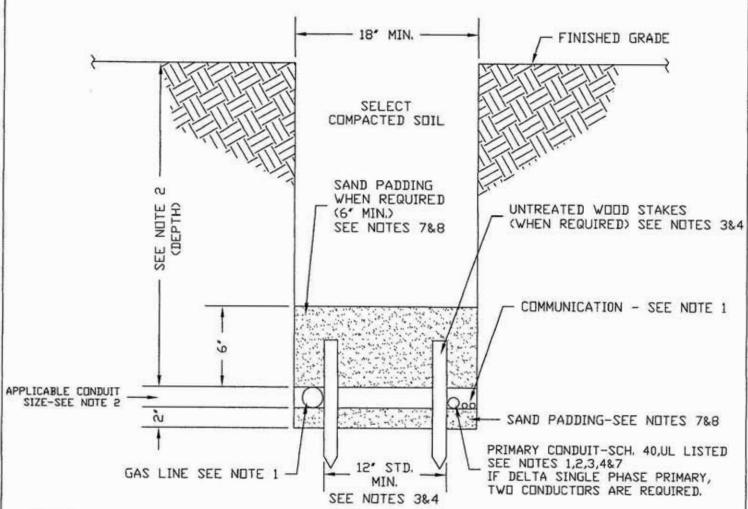
All exposed surfaces shall be smooth and even when completed. Any and all unsightly ridges or lips or exposed concrete shall be removed by tooling and rubbing. All loose stones and holes shall be cleaned out. The surfaces shall then be: completely soaked with water (or appropriate liquid) and the defects repaired with concrete such as to provide a smooth, even surface to the satisfaction of the Company's authorized engineering representative.

## Defective Concrete:

All concrete work not conforming to the preceding; including physical dimension, size and shape; as shown on referenced drawings, out of alignment or level; or showing a defective surface; shall be removed and completely

replaced in a manner meeting with the approval of the Company's authorized engineering representative. Slight imperfections in appearance of the structure may be repaired <u>ONLY</u> when the customer has obtained the permission of the Company's authorized engineering representative.

LOCATION OF UNDERGROUND FACILITIES (JOINT UTILITIES) IN 5KV DELTA, 15KV OR 35KV TRENCH



#### NOTES:

- THE PRIMARY CONDUIT AND COMMUNICATIONS (TELEPHONE, CATV, ETC.) SHALL BE INSTALLED FIRST FOLLOWED BY GAS WHEN APPLICABLE. CONSULT THE APPLICABLE GAS UTILITY FOR THEIR INSTALLATION SPECIFICATIONS.
- 2. THE <u>STANDARD MINIMUM</u> DEPTHS AND PRIMARY CONDUIT SIZES ARE IN ACCORDANCE WITH THE FOLLOWING VOLTAGE CLASSES:

VOLTAGE CLASS	CONDUIT SIZE (# OF PHASES)	DEPTH
SKV DELTA	3' DR 4' (1Ø)	30*
15KV	2' (10)	30*
15KV	4" (3Ø)	30*
35KV	4" (10)	36*
35KV	6' (3Ø)	36*

- 3. ELECTRIC, COMMUNICTION AND GAS FACILITIES MUST BE STAKED WHERE REQUIRED TO MAINTAIN THE CLEARANCES STATED IN NOTE #4.
- 4. THE STANDARD MINIMUM CLEARANCE FOR UGND ELECTRIC AND COMMUNICATION FACILITIES SHALL BE TWELVE (12") FROM A GAS LINE, IF NOT PRACTICLE TO OBTAIN, THE ABSOLUTE MINIMUM SHALL BE SIX (6") AND RANDOMLY STAKED WITH UNTREATED WOOD STAKES.
- 0-600V ELECTRIC SERVICE INSTALLATION SHALL BE IN ACCORDANCE WITH THE COMPANY'S REQUIREMENTS AND THE N.E.C.
- 6. NO CUSTOMER OWNED SECONDARY (0-600V) CONDUCTORS OR PRIVATE COMMUNICATION CABLES ARE PERMITTED IN THE TRENCH WHERE A RIGHT-OF-WAY HAS BEEN GRANTED TO THE COMPANY,
- 7. SAND IS REQUIRED WHEN
  - a. GAS IS PRESENT.
  - b. ANY PORTION OF OR ENTIRE TRENCH IN ON ROCK OR SHALE.
  - c. THE PRIMARY CABLE(S) ARE DIRECT BURIED. A SPARE CONDUIT IS RECOMMENDED WITH THIS APPLICATION
- 8. IF REQUIRED BY THE COMPANY, OR OTHER AUTHORITY HAVING JURISDICTION, CONCRETE ENCASEMENT OF THE DUCT BANK MAY BE REQUIRED, SEPARATE SPECIFICATIONS WILL BE ISSUED.

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# SPECIFICATIONS & EXPLANATORY NOTES FOR TRANFORMERS INSTALLED AT GROUND LEVEL

# NOTES AND SPECIFICATIONS:

1. INSTALLATION SHALL BE IN ACCORDANCE WITH:

- A. D&RU, INC. FILED TARIFF AND SPECIFICATIONS FOR:
  - 1. ELECTRICAL INSTALLATIONS
  - 2. NON-RESIDENTIAL PAD MOUNTED TRANSFORMER INSTALLATIONS
- B. THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE
- C. ALL APPROPRIATE CODES AND ORDINANCES

ANY DEVIATION FROM THE PRECEDING MUST BE APPROVED BY THE ELECTRICAL ENGINEERING DEPARTMENT OR O&RU, INC. AS WELL AS THE APPROPRIATE AGENCIES HAVING JURISDICTION OVER THE INSTALLATION (SEE ITEMS B AND C ABOVE.)

- 2. RESPONSIBILITY FOR DESIGN AND CONSTRUCTION IN CONFORMANCE WITH ALL CODES RESTS WITH THE OWNER.
- 3. SITE PREPARATION
  - A. SOIL BENEATH THE CRUSHED STONE AND SURROUDING AREA TO BE COMPACTED TO 90% OF ORIGINAL DENSITY TO ELIMINATE SHIFTING OF TRANSFORMER AND PAD IF INSTALLATION IS LOCATED ON FILLED EARTH.
  - B. PROVIDE ADEQUATE WATER DRAINAGE AWAY FROM THE PAD INSTALLATION BY GRADING OR DRAIN TILE.
  - C. PROVIDE PROTECTION WITH VEHICULAR BUMPER POSTS IF EXPOSED TO VEHICULAR TRAFFIC. INSTALLATION MUST CONFORM TO PARAGRAPH 7, SKETCH G.
  - D. PROVIDE NECESSARY UNDBSTRUCTED ACCESS TO D&R DWNED FACILITIES TOGETHER WITH THE RIGHT TO REMOVE DBSTRUCTION IF NECESSARY FOR SUCH ACCESS. EASEMENT TO THE INSTALLATION MUST BE DBTAINED FROM PROPERTY DWNER.
  - E. ANY FENCE OR WALL INSTALLED AROUND THE TRANSFORMER INSTALLATION MUST BE INSTALLED IN ACCORDANCE WITH PARAGRAPH NO. 1 AND PARAGRAPH NO. 7 OF THIS SPECIFICATION.
  - F. CONCRETE TO TEST TO 3000 POUNDS PER SQUARE INCH COMPRESSION AT 28 DAYS WITH  $6 \times 6 \times 6/6$  WIRE MESH AS SHOWN IN FIG. 4.

#### 4. GROUNDING

- A. MINIMUM WIRE SIZE TO BE 2/0 AWG. STR. COPPER BETWEEN TRANSFORMER GROUND PADS AND TRANSFORMER GROUND BUS (RODS). GROUND BUS CABLE TO BE BARE STRANDED COPPER IN EARTH WITH A DEPTH OF 18' BELOW FINAL GRADE ELEVATION.
- B. METAL ENCLOSURE, PRIMARY AND SECONDARY METAL CONDUITS TO BE GROUNDED WITH MINIMUM #2 AWG. BARE STRANDED COPPER.
- C. BOND PRIMARY CONDUITS ON RISER POLE TO O&RU, INC. DRIVEN GROUND ROD(S) WITH A MINIMUM OF #2 AWG. STR. COPPER. CUSTOMER TO SUPPLY AND INSTALL CONDUIT GROUND CLAMPS, GROUND WIRE AND GROUND ROD CLAMP FOR BONDING GROUND WIRE TO THE O&RU, INC. DRIVEN GROUND ROD(S). (SEE FIG. 8).
- D. ALL BELOW GRADE UL LISTED (FOR DIRECT BURIAL USE) SPLICES TO BE BY AN OR&U, INC. ELECTRICAL ENGINEERING DEPARTMENT APPROVED METHOD AND INSPECTED BY THE COMPANY'S ELECTRICAL ENGINEERING DEPARTMENT PRIOR TO BACKFILL. THEY INCLUDE: AMP WRENCHLOK CONNECTORS, CADWELD OR THERMOWELD PROCESS, 'AMPACT FIRED ON' CONNECTORS OR COMPRESSION CONNECTORS THAT HAVE BEEN APPROVED BY THE COMPANY'S ELECTRICAL ENGINEERING DEPARTMENT.
- E. PRIMARY TERMINATIONS TO BE GROUNDED AS PER THE APPROPRIATE COMPANY SPECIFICATIONS AND/OR DRAWINGS.
- F. ANY METAL FENCE INSTALLED WITHIN TEN FEET (10 FT.) OF THE TRANSFORMER INSTALLATION SHALL BE BONDED TO THE TRANSFORMER GROUND BUS (RODS) WITH #2 AWG. BARE STRANDED COPPER WIRE.

#### 5. CABLES AND TERMINATIONS

- A. PRIMARY PHASE CONDUCTORS
  - PRIMARY CABLE TYPE AND CONSTRUCTION MUST BE SUBMITTED IN WRITING TO THE O&RU, INC. ENGINEERING DEPARTMENT FOR REVIEW AND APPROVAL BEFORE PURCHASE AND INSTALLATION TO INSURE COMPATABILITY WITH THE COMPANY DISTRUBITION SYSTEM AND EQUIPMENT.
  - 2. THE MINIMUM PRIMARY CONDUCTOR SIZE FOR 15KV PRIMARY VOLTAGE IS #2 AWG, THE MINIMUM PRIMARY CONDUCTOR SIZE FOR 35KV PRIMARY VOLTAGE IS 1/0 AWG. THE CONDUCTOR MAY BE EITHER COPPER OR ALUMINUM AS SPECIFIED BY THE LATEST EDITIONS OF A.E.I.C. NO. 5 AND THE I.C.E.A.

# SPECIFICATIONS & EXPLANATORY NOTES FOR TRANSFORMERS INSTALLED AT GROUND LEVEL

## 5. CABLES AND TERMINATIONS (CONTINUED)

3. JACKETED CONCENTRIC NEUTRAL PRIMARY CABLE WITH A FULL NEUTRAL OR SHIELDED JACKETED PRIMARY CABLE WITH A SEPARATE NEUTRAL MUST BE INSTALLED IN METALLIC OR PVC SCHEDULE 40 CONDUIT AT A MINIMUM BURIED DEPTH DESCRIBED IN FIG. 1.

#### B. PRIMARY NEUTRAL CONDUCTORS

- PRIMARY NEUTRAL CABLE IS TO BE THE SAME SIZE AS THE PHASE CONDUCTOR AND NO SMALLER THAN #2 AWG, COPPER FOR 15KV CABLES AND 1/0 AWG, COPPER FOR 35KV CABLES, PRIMARY NEUTRAL SHALL HAVE 600 VOLT INSULATION.
- 2. PRIMARY NEUTRAL MUST BE INSTALLED WITH PHASE CONDUCTORS ON ALL INSTALLATIONS AND TERMINATED IN ONE CONTINUOUS RUN. A SEPARATE PRIMARY NEUTRAL IS NOT REQUIRED IF THE PRIMARY PHASE CONDUCTORS ARE OF THE JACKETED CONCENTRIC NEUTRAL TYPE.
- 3. PRIMARY NEUTRAL IS TO TERMINATE ONLY ON THE:
  - a. HD BUSHING FOR WYE CONNECTED PRIMARY WINDINGS WITH "LIVE FRONT" DESIGN ON 30 UNITS.
  - b. XD BUSHING FOR DELTA CONNECTED PRIMARY WINDING WITH 'LIVE FRONT' DESIGN ON 3Ø UNITS.
  - C. HO-XO BUSHING FOR THREE PHASE PHASE UNITS OF THE "DEAD FRONT" DESIGN.
  - d. X2 BUSHING FOR GROUNDED WYE PRIMARY SINGLE PHASE UNITS OF BOTH 'LIVE AND DEAD FRONT' DESIGNS.
  - e. TRANSFORMER GROUND GRID FOR DELTA PRIMARY SINGLE PHASE UNITS OF BOTH "LIVE AND DEAD FRONT" DESIGNS.
- 4. PRIMARY NEUTRAL TO BE CONNECTED TO GROUND BUS (RODS) WITH 2/0 COPPER.

# C. SECONDARY CONDUCTORS

- 1. ALL SECONDARY CABLE TRANSFORMER CONNECTIONS ARE TO BE MADE UTILIZING:
  - a. BRONZE BOLTS AND WASHERS ON COPPER TRANSFORMER TERMINALS AND CONNECTORS.
  - b. CADMIUM OR DURIUM BOLTS AND WASHERS ON ALUMINUM TRANSFORMER TERMINALS AND CONNECTORS.
  - C. STAINLESS STEEL BOLTS AND WASHERS TO CONNECTORS RATED AL. OR AL/CU.
- 2. SECONDARY NEUTRAL TO BE CONNECTED TO GROUND BUS (RODS) WITH A MINIMUM OF 2/0 COPPER.

### 6. CONDUITS

- A. BELOW GRADE PRIMARY AND SECONDARY CONDUITS AT THE TRANSFORMER LOCATION MAY BE NEC APPROVED SCHEDULE 40 PVC FOR DIRECT BURIAL.
- B. PRIMARY CABLE RISER CONDUIT AND SWEEP AT THE RISER POLE MUST BE A MINIMUM OF 4" OR 6" GALVANIZED STEEL. (SEE SECTION VII OF TEXT).
- C. SIZE OF PRIMARY CONDUIT IS TO BE IN ACCORDANCE WITH FIG. 1, NOTE #2.
- D. SECONDARY CONDUITS ARE NOT TO EXTEND BEYOND DIMENSION I OF THE SINGLE UNIT 3Ø TRANSFORMER PAD AS SHOWN ON FIG. 14 MINIMUM SIZE 2" I.D.
- E. CONDUITS NOT TO EXTEND ABOVE CONCRETE PAD FOR SINGLE UNTIL 3Ø TRANSFORMERS AS SHOWN ON FIG. 4

#### 7. CLEARANCES

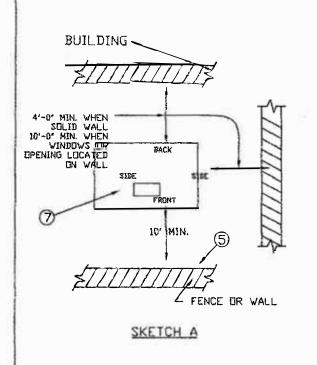
- A. THE TRANSFORMER INSTALLATION SHALL BE LOCATED AS FAR AS PRACTICAL FROM WINDOWS, DOORS, FIRE ESCAPES, ENTRANCES, GAS METERS, GAS REGULATORS, EQUIPMENT, LOADING RAMPS, AND VENTILATING DUCTS SO AS NOT TO PRESENT A PHYSICAL OBSTRUCTION. THE FOLLOWING ARE MINIMUM HORIZONTAL CLEARANCES BETWEEN:
  - 1. BACK AND SIDES OF PAD (FOR SINGLE UNIT TRANSFORMER INSTALLATIONS) AND ANY FENCE OR WALL-FOUR FEET (4'), SEE SKETCH A.
  - 2. BACK AND SIDES OF PAD AND WALL BELOW WINDOWS OR ANY OPENING TEN FEET (10'). SEE SKETCHES A AND B.
  - 3. SIDES OF PAD AND DOORS, GRADE ELEVATION WINDOWS, OR ACCESS OPENINGS TEN FEET (10'). SEE SKETCH C.
  - 4. SIDES OF PAD AND GAS METERS, OR GAS REGULATORS TEN FEET (10'), SEE SKETCH D.
  - 5. SIDES OF PAD AND EQUIPMENT, AND VENTILATING DUCTS TEN FEET (10'). SEE SKETCH C.
  - 6. FRONT OF PAD AND ANY FENCE, WALL OR EQUIPMENT TEN FEET (10'). SEE SKETCH A.

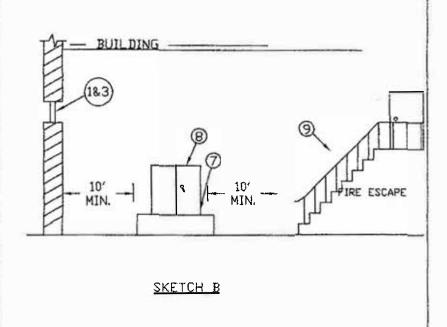
# 7. CLEARANCES (CONTINUED)

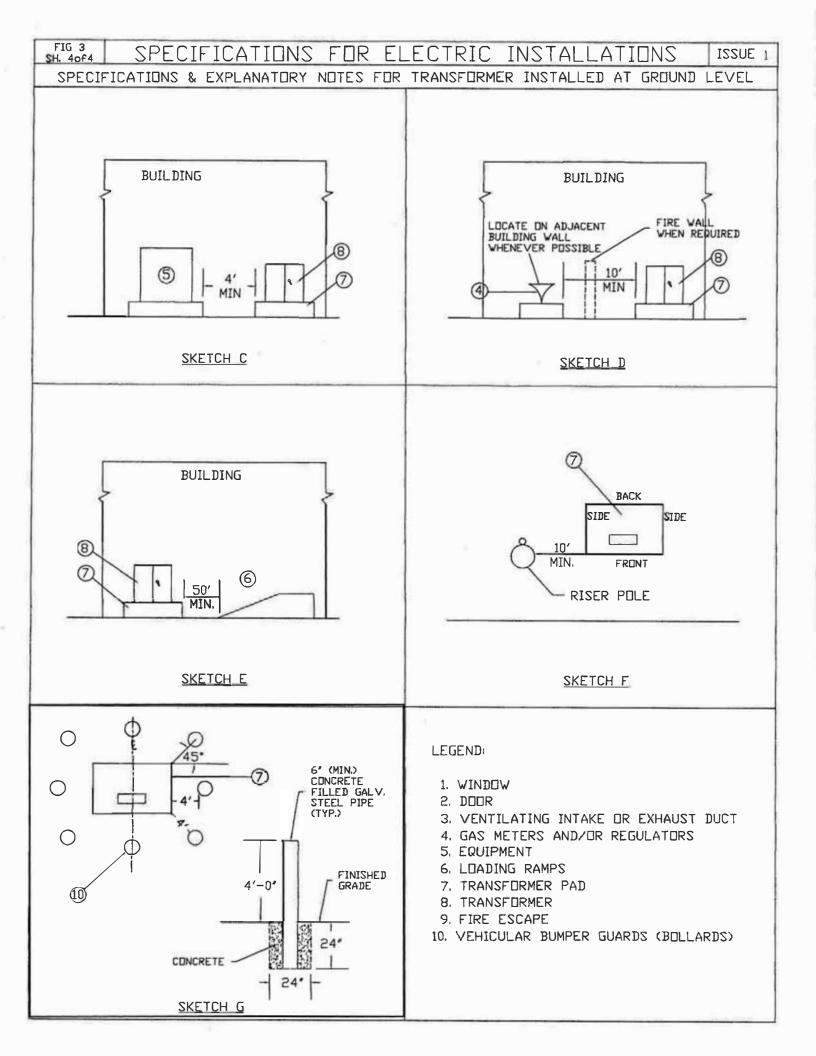
- 7. SIDE OF PAD AND ANY LOADING RAMP FIFTY FEET (50'), SEE SKETCH E.
- 8. SIDE OF PAD AND ANY RISER POLE TEN FEET (10'), SEE SKETCH F.
- 9. SIDES OF PAD AND ANY COMBUSTIBLE WALL OR OVERHANG TEN FEET (10').
- 10. SHRUBBERY SHALL NOT BE INSTALLED IN FRONT OF THE TRANSFORMER AND A MINIMUM CLEARANCE OF FOUR FEET (4") AWAY FROM LIMBS ON THE REMAINING THREE (3) SIDES.
- B. D&R ENGINEERING DEPARTMENT WILL DETERMINE TRANSFORMER LOCATION WHEN EGRESS IS FROM AUDITORIUM OR PUBLIC BUILDING. ANY PROPOSED INSTALLATION WHICH THE D&R ENGINEERING DEPARTMENT DEEMS CONTROVERSIAL SHALL BE REFERRED TO THE PROPER FIRE INSPECTION AGENCY FOR APPROVAL BEFORE CONSTRUCTION, SEE THE FOLLOWING SKETCHES.
- C. TRANSFORMER INSTALLATION IS NOT TO BE LOCATED: IN FRONT OF BUILDING DOORS,

  VENTILATION DUCTS OR ACCESS OPENINGS OR BENEATH BUILDING OVERHANG OR OVERHEAD

  WALKWAY.







# THREE PHASE PADMOUNT TRANSFORMER CONCRETE PAD SPECIFICATIONS

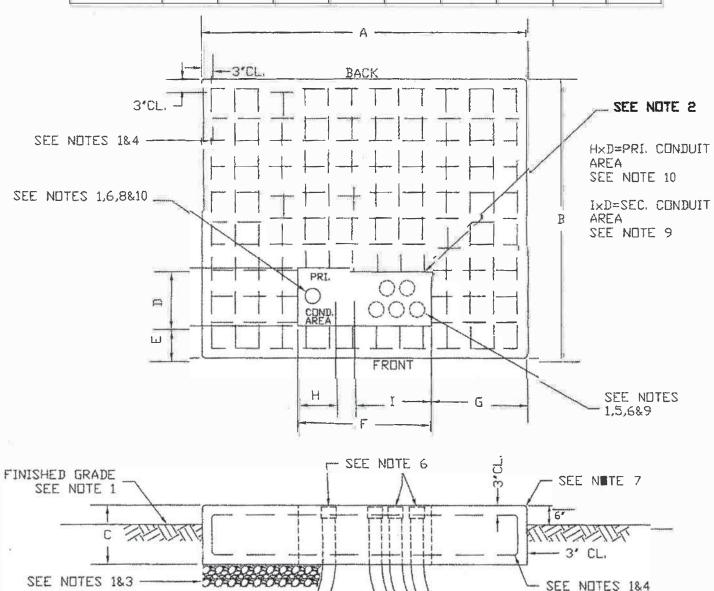
# NOTES:

- 1. SEE FIG. 3 FOR ADDITIONAL REQUIREMENTS, SPECS. AND CLEARANCE REQUIREMENTS.
- 2. OPENING TO BE D X F DIMENSIONS (AFTER FORM IS REMOVED).
- 3. CRUSHED STONE ±3'-0' BENEATH PAD.
- 4, 6" X 6" X 6/6 WIRE MESH.
- 5. NUMBER OF SECONDARY CONDUITS TO CUSTOMERS EQUIPMENT TO SUIT LOAD AND SITE CONDITIONS.
- 6. CONDUITS NOT TO EXTEND ABOVE PAD.
- 7. PAD SHALL BE LEVEL AND ALL EDGES CHAMFERED.
- 8. WHEN REQUIRED, TWO (2) PRIMARY CONDUITS IN THIS AREA.
- 9. SECONDARY CONDUITS NOT TO EXCEED "I" DIMENSION.
- 10. PRIMARY CONDUITS SHALL BE WITHIN DIMENSION H.
- 11. ALL PAD DIMENSIONS ARE THE FINISHED PRODUCT, AFTER ALL FORMS ARE REMOVED.

  12. WARNING: DO NOT PULL IN ANY PRIMARY OR SECONDARY WIRES. YOU MUST WAIT FOR THE TRANSFORMER TO BE DELIVERED.

# PAD DIMENSIONS

TRANSFORMER SIZE-KVA	Α	В	С	D	E	F	G	Н	I
75-500	8'-6"	7'-3"	12"	13*	16"	42"	24"	12"	18*
750-1000	9'-0"	7'-8"	12"	18"	10"	42"	30*	12*	24*
1500-2500	11'-0"	9'-2"	18"	18"	10"	42"	42"	12"	24'

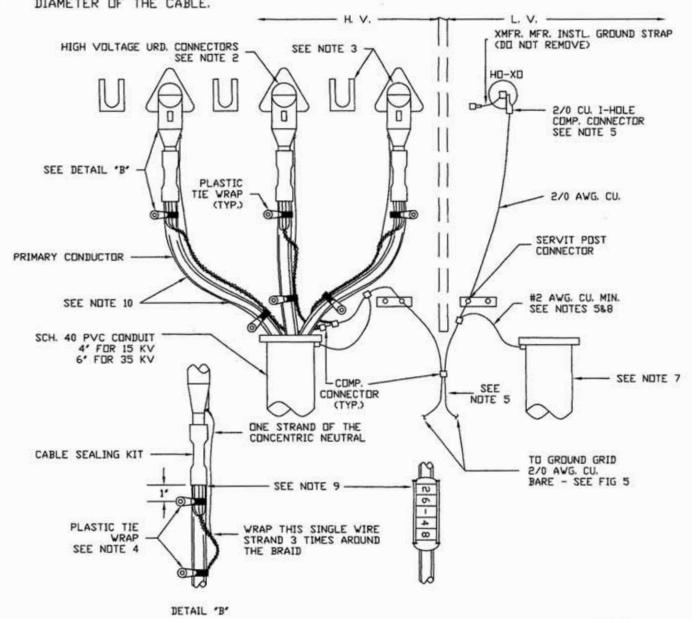


GRD. CABLE SEE NOTE 1

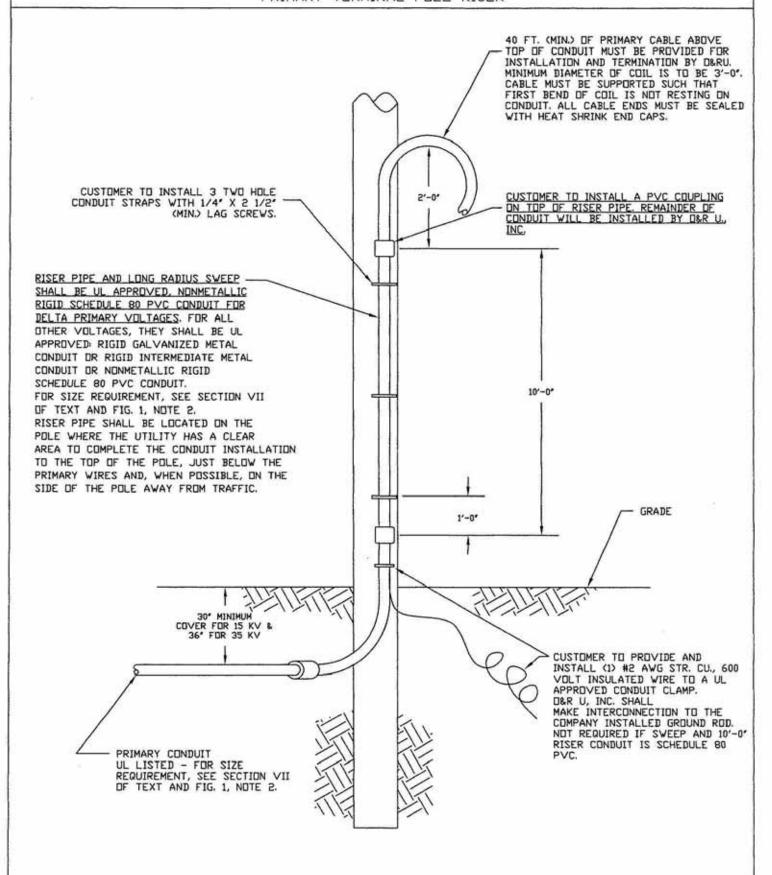
## 3Ø RADIAL FEED PADMOUNT XFMR DEAD FRONT 15KV DR 35KV INSTALLATION

#### NOTES:

- 1. SEE FIGS. 3 AND 11 FOR ADDITIONAL REQUIREMENTS AND SPECIFICATIONS.
- 2. FOLLOW MANUFACTURER'S TERMINATOR INSTRUCTIONS, EXCEPT FOR GROUNDING, INSTALL AS SHOWN.
- 3. CABLE TO HAVE SUFFICIENT SLACK SUCH THAT THE CABLE TERMINATOR MAY BE INSTALLED ON A STANDOFF BUSHING PLACED IN THE APPROPRIATE PARKING STAND.
- 4. INSTALL THE TOP ELBOW TIE WRAP PRIOR TO TWISTING CONCENTRIC NEUTRAL, TIGHTEN THE TIE WRAPS WITH ONLY SUFFICIENT TENSION ON THE TIE WRAP TO HOLD THE WIRES IN PLACE. DO NOT OVER-TIGHTEN SUCH AS TO CAUSE DAMAGE TO THE CABLE BY EMBEDDING THE CONCENTRIC WIRES INTO THE SEMI-CONDUCTING JACKET.
- 5. PRIMARY NEUTRAL, GROUND GRID, HO-XO BUSHING, METAL CONDUIT GROUNDS AND XFMR TANK GROUNDS MUST BE INTERCONNECTED PRIOR TO FINAL INSPECTION.
- 6. IN ADDITION TO BEING SECURED WITH A PENTA HEAD BOLT, THE SECONDARY COMPARTMENT DOOR IS TO BE LOCKED WITH A PADLOCK HAVING A SHACKLE LENGTH OF 1 5/8" OR LESS.
- 7. SECONDARY CONDUIT(S) SIZED TO ACCOMODATE CUSTOMER REQUIREMENTS.
- 8. GROUNDING CONDUCTOR REQUIRED FROM EACH GALVANIZED STEEL CONDUIT, IF INSTALLED.
- INSTALL GRID COORDINATE AND PHASE I.D. TAGS AS PER INSTRUCTION FROM THE COMPANY REPRESENTATIVE.
- 10. THE RADIUS OF THE BEND IN THE CABLE SHALL NOT BE LESS THAN 12 TIMES THE OVERALL DIAMETER OF THE CABLE.



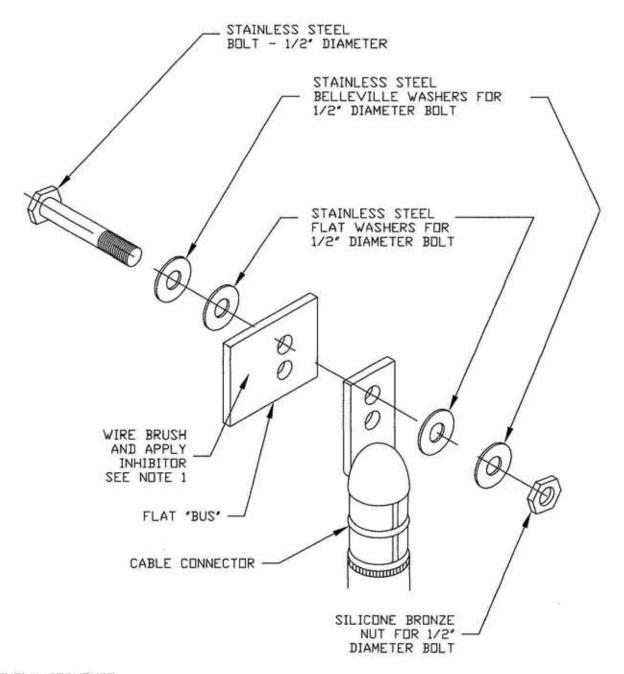
# PRIMARY TERMINAL POLE RISER



# COMPRESSION CONNECTOR TO CU. OR STEEL FLAT BAR INSTALLATION

#### NOTES:

- 1. WIRE BRUSH CONNECTOR ONLY IF:
  - a. CONNECTOR IS NOT PLATED.
  - b. IN DOUBT AS TO PLATING EXISTANCE.
- 2. DNE BOLT, ASSOCIATED WASHERS AND NUT ARE REQUIRED FOR EACH HOLE OF A CABLE COMPRESSION CONNECTOR FASTENED TO A FLAT "BUS BAR" (NOTE: ADDITIONAL SET IS REQUIRED FOR CONNECTION SHOWN).



### ASSEMBLY SEQUENCE:

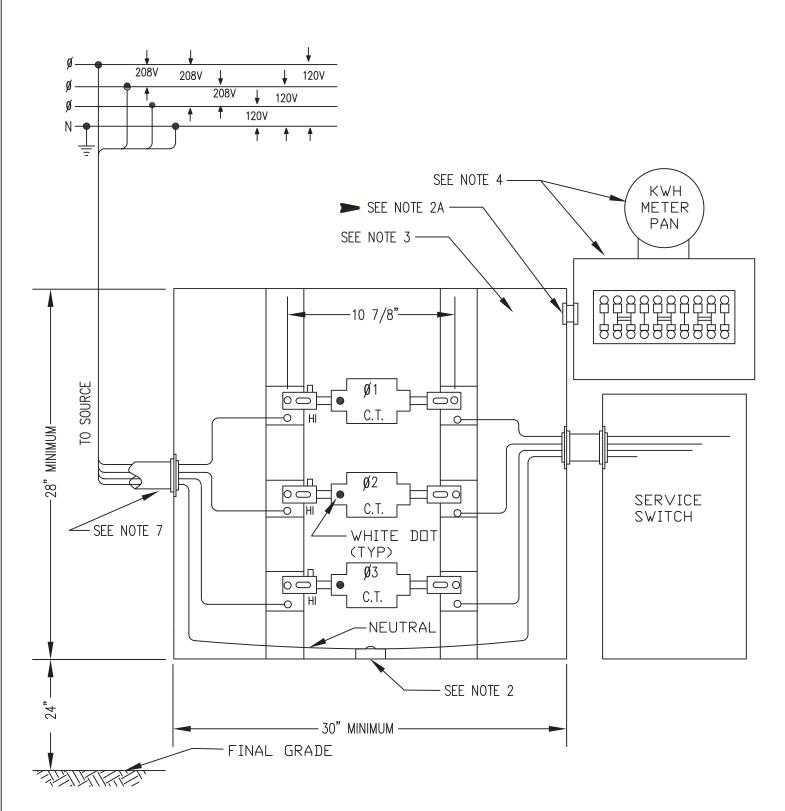
- A. MATING SURFACES SHOULD BE FLAT, SMOOTH SURFACES FREE OF DIRT AND CONTAMINATION FOR MAXIMUM CURRENT TRANSFER, WIRE BRUSH 'BUS' BEFORE ASSEMBLY, (SEE NOTE 1)
- B. LUBRICATE MATING SURFACES WITH A THIN COATING OF AN OXIDE INHIBITOR.
- C. ASSEMBLE AND TORQUE TO 45 FT. POUNDS. D. WIPE OFF EXCESS INHIBITOR.

METER INSTALLATION FOR 30, 4W SERVICE 120/208 VOLT, MAXIMUM 1200A SERVICE

# NOTES:

- 1. INSTALLATION SHALL BE IN ACCORDANCE WITH THE LATEST COMPANY SPECIFICATIONS AND THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE, NFPA 70, THE INSTALLATION SHALL ALSO BE INSPECTED BY THE AUTHORITY HAVING JURISDICTION.
- > 2. IF NOT ALREADY INSTALLED BY THE MANUFACTURER, THE CUSTOMER'S QUALIFIED ELECTRICIAN SHALL INSTALL A #10 LUG ON THE NEUTRAL GROUND PAD OF THE CURRENT TRANSFORMER CABINET FOR THE COMPANY'S USE.
- ► 2A. THE CONDUIT BETWEEN THE C.T. CABINET AND METER SOCKET/TEST SWITCH SHALL BE 2 INCH RGS(RIGID GALVANIZED STEEL) CONDUIT, IMC (INTERMEDIATE METAL CONDUIT) OR EMT(ELECTRIC METALLIC TUBING) AND SHALL NOT EXCEED 50 FT. IN LENGTH, PVC OR FLEXIBLE CONDUITS, L.B.'S OR CONDULETS ARE NOT PERMITTED.
  - 3. C.T. METERING CABINET SHALL NOT BE SMALLER THAN 28"H X 30"W X 10"D. C.T.'S ARE SUPPLIED BY D&RU, INC.
  - 4. THE QUALIFIED ELECTRICIAN SHALL SUPPLY & INSTALL ALL COMPANY APPROVED METERING CABINETRY, INCLUDING THE COMBINATION METER SOCKET AND TEST SWITCH, THE CENTER OF THE KWH METER PAN SHALL BE BETWEEN 4-1/2' TO 5-1/2' ABOVE FINAL GRADE, REFER TO "ORU,COM" WEBSITE FOR THE LATEST LIST OF APPROVED METERING EQUIPMENT. THE KWH METER WILL BE SUPPLIED AND INSTALLED BY THE COMPANY.
  - 5. WIRING FROM THE SECONDARY SIDE OF THE C.T.'S TO THE TEST SWITCH SHALL BE INSTALLED BY THE COMPANY WITH THE SERVICE DE-ENERGIZED.
  - 6. ALL METERING EQUIPMENT TO BE OUTDOORS. CUSTOMER TO SUPPLY AND INSTALL WHERE NECESSARY, PROPER WATER PROOFING ON OR IN THEIR EQUIPMENT.
  - 7. SERVICE CONDUITS MAY ENTER AND EXIT AT THE BOTTOM OF THE C.T. CABINET.
- ▶ 8. REFER TO THE MOST RECENT EDITION OF THE GENERAL SPECIFICATIONS FOR ELECTRIC INSTALLATIONS (BLUE BOOK), SECTION VII, METERS AND METERING EQUIPMENT BELOW 600 VOLTS, FOR EQUIPMENT AND CONDUCTOR LABELING REQUIREMENTS.

METER INSTALLATION FOR 30, 4W SERVICE 120/208 VOLT, MAXIMUM 1200A SERVICE



IMPORTANT: REFER TO THE MOST RECENT EDITION OF THE GENERAL SPECIFICATIONS FOR ELECTRIC INSTALLATIONS (BLUE BOOK), SECTION VII, METERS AND METERING EQUIPMENT BELOW 600 VOLTS, FOR EQUIPMENT AND CONDUCTOR LABELING REQUIREMENTS.

#### Approved 15 kV Material List

Note: All material supplied & installed by others,

unless otherwise noted.		O&R's	Description			
Mfg.	Cat. No.	M&S No.		Quantity		
Ohio Brass	218909-7324	5910224	8.4 KV MOV Lightning Arrester (supplied by O&R)			
		30031	4" Galvanized 90 Degree 36" Radius Steel Bend	** 1		
Meter Devices Co.	507U4163		Double Door Metering Cabinet - 36" X 32" X 16" Deep			
Rome Cable		5630026	#2 Cu 5 KV (supplied by O&R)			
		40001	4" Galvanized Steel Conduit	** 10 ft		
Amp Inc.	83749 - 3	5710204	WRENCH-LOK Ground Connector	2		
T&B/Blackburn	6258	70026	5/8" X 8' Copperweld Ground Rod	2		
	i	5640802				
Rome Cable		5640015	#2 AWG Cu Bare Tinned	** 5 ft		
Rome Cable		5640004	#2/0 AWG Cu Bare Tinned (Equipment Ground Grid Wire)	60 ft		
Elastimold	160 - DRG	5790001	15 KV Ground Protective Cap			
Carlon or	UA5FNB	5,70001	(for box pad's entry & exit)			
Cantex	5233853	50004	4" PVC, Schedule 40, 22.5 Degree - 36" Radius Bend			
Carlon or	U - A9FNB	20001	1 1 1 0, Belledate 10, 2215 Begree 50 Radias Bella			
Cantex	5233842	50034	4" PVC, Schedule 40, 90 Degree - 36" Radius Bend	1		
Okonite or	O&R Spec. No.	30034	+ 1 ve, beneaute +0, yo begree - 30 Radius Bena	1		
Kerite	62386	5630034	#2 AWG Al Conductor - 15 KV	As required		
Gibbons or	GB - 5901	3030034	#2 AWG AI Colluctor - 15 KV	As required		
T&D/Blackburn	3905 - BU	220011	4" Steel Conduit Ground Connector	** 1		
Carlon or	49015	220011	- Steet Collidate Croming Collinector	.*1		
		50025	All DVG C	A 1		
Cantex	A52EA12	50035	4" PVC Conduit - Schedule 40 (UL Approved)	As required		
3M	7652-S-4-2	5720029	#2 AWG Terminator 15 KV	*3		
Elastimold	166LR-A-5220	5720079	#2 AWG Loadbreak Elbow 15 KV	3		
Elastimold	1601A4	5720098	15 KV Loadbreak Bushing Well Insert			
Highline or	HL - 72					
Nordic	GS -55-45-32-OR	30007	Fiberglass Box Pad			
Highline or	HL - 72 - 2A					
Nordic	GS -55-45-OR	30008	Cover for above Box Pad			
Elastimold	163J4R - CS646	5710040	15 KV Four Way Loadbreak Junction (LBC-4)			
Highline or	HL - 73 - 2					
Nordic	GS -67-59-36-OR	30009	Fiberglass Box Pad 15 KV Meter			
Highline or	HL - 73 - 2A					
Nordic	GSC-67-59-OR	30010	Cover for above Box Pad			
Durham	1005724A					
Rev. F	Dated: 12/18/02	5300007	15 KV Meter Transclosure			
Carlon or	E942N					
Cantex	5140052	50031	Coupling 4" PVC to Steel (FA Adapter)	** 2		
Carlon	E997N	50016	4" PVC End Bell	1		
Raychem	ESC - 3 - A	5990053	Heat Shrink Cable End Cap	7		
Burndy or	GRC58					
T&B/Blackburn	JAB518H	70086	5/8" Ground Rod Clamp	** 1		
Burndy	K2C26	5720012	Transformer Ground Pad Connector #2 - 2/0 Stranded (Servit Post)	2		
Burndy or	YA26A1					
Homac	L210 - 38	5710089	#2/0 Cu 1 Hole Compression Connector	1		
Carlon or	E940N			<u> </u>		
Cantex	6141632	50041	4" PVC Coupling	***1		
Burndy	YC26C2	5710082	Compression Connector: #2 Cu - 2/0 Cu	3		
Burndy	YC26C26	5710071	Compression Connector: #2/0 Cu - 2/0 Cu	<del>                                     </del>		
Cooper Power	DF13L3	70111	Screw, Lag 3/8" X 3"	6		
3M	8452	5990052	15 KV Cable Sealing Kit	3		
Utilities Service Co.	9020	70180	4" Galvanized Steel Pipe Strap	3		
oundes service Co.		1 /0100	- Garvanized Steet I the Strah	3		
Llamaa			#2 AWG 2 Hole Compression Connector (Parlesse stars			
Homac	SA2 - NTN	5710086	#2 AWG, 2 Hole Compression Connector (Replaces stem			
	SA2 - NTN	5710086	connectors for 15 KV terminators at the switch)			
Homac  Homac Chance						

<sup>\*</sup> ITEMS TO BE SUPPLIED BY CUSTOMER AND INSTALLED BY UTILITY - PLEASE LEAVE IN TRANSFORMER

NOTE: The above items may be purchased from electrical supply houses including:

<sup>\*\*</sup> NOT REQUIRED IF SCHEDULE 80 PVC CONDUIT IS INSTALLED ON RISER POLE

<sup>\*\*\*</sup>NOT REQUIRED IF GALVANIZED STEEL CONDUIT IS INSTALLED ON RISER POLE

<sup>1.</sup> Turtle & Hughes, Inc., Whippany, N.J., 1(973) 386-1122

<sup>2.</sup> WESCO Distribution, Parsippany, N.J. 1(800) 624-6699

<sup>3.</sup> Swift Electrical Supply, Nanuet, N.Y. 1(845) 623-3425

<sup>4.</sup> Kandel Bros., Middletown, N.Y. 1(845) 343-3200

# Project 20220620206 - Lasser Park Senior Center Trench and Riser Pole Inspection Checklist

Trench				
See Figure 1.	Yes	No		
Is the entire trench completed and open?				
Is the trench 36 inches deep?				
Is the Schedule 40 UL approved conduit in the trench?				
Is the excavation for the transformer pad completed?				
Will the edge of the concrete transformer pad be at least 4 feet (5 feet when bollards are				
required) and not more than 10 feet from the edge of a minimum 12-foot-wide drivable surface? It must be.				
Is electrical warning tape available to be installed 1foot below final grade?				
is creedited warming tape available to be installed 11000 below that grade.				
Riser Pole				
See Figure 8.	Yes	No		
Where the riser conduit attached to the pole:	105	110		
1. Is it on the opposite side of the pole away from traffic?				
2. For Orange and Rockland to complete the conduit installation to the top of the pole	·,			
are there any other wires (i.e. telephone, cable TV, support wires) in the way? Then				
must not be.				
Is the riser pipe attached to the pole with <b>galvanized steel</b> conduit straps and 3/8 inch x				
3inch lag bolts?				
If rigid galvanized metal conduit was used, is the pipe ground clamp and #2 AWG Cu wir attached?	е 📙	Ш		
Has a PVC female (FA) adapter been installed at the top of the riser pipe?				
INSPECTION POLICY		Ш		
ALL OF THE ABOVE ITEMS MUST BE COMPLETED, UNLESS OTHER ARRANGEME BEEN MADE. A FEE WILL BE ASSESSED TO THE RESPONSIBLE PARTY FOR ANY SUNSPECTIONS REQUIRED DUE TO NON-COMPLIANCE OR NON-COMPLETION.  Comments:				
Signature: Print Name: Print Name: Phone		— 1 of 1		

To schedule an inspection, fax completed checklist to 914-925-6804 or send by email to <u>Distributionengineering@oru.com</u>.

# Project 20220620206 - Lasser Park Senior Center Transformer Pad and Ground Grid Inspection Checklist

See Figures 3, 4 and 5		Ye	S	No	)
Is there 3 feet of crushed stone beneath the p	pad forms?			T	Ī
Are <b>both</b> forms (or pre-cast pad) completed,	, level and in place?	┢			Ī
Is the grounding completed and complete	ly exposed for inspection?				Ī
Are both <u>Copperweld</u> ground rods totally in inches below final grade? They must be.	n earth (not in stone) and driven down to 18				Ī
Is the pad form at least 4 ft behind the curb (	(or bollards, where applicable)?				Ī
Is the outer form at least 10 feet from any bu	ailding opening? It must be.				
ALL OF THE ABOVE ITEMS, INCLUD (WHEN APPLICABLE), MUST BE COM BEEN MADE. A REPEAT INSPECTION	IE PAD SITE MUST BE WITHIN 6 FORMER DELIVERY WILL NOT BE	ENTS PONS	HA IBI	AVE	
Comments:					
Signature:	Print Name:				

To schedule an inspection, fax completed checklist to 914-925-6804 or send by email to <u>Distributionengineering@oru.com</u>.

\_\_\_\_\_ Phone \_\_\_\_\_ Page 1 of 2

Rev. 09102018

# Project 20220620206 - Lasser Park Senior Center Final Inspection Checklist

# **Riser Pole** See Figure 8. Yes Is there 50 feet of each cable allocated for the riser pole? Are the primary cable ends sealed to prevent moisture and dirt contamination? Where attaching the riser conduit to the pole: 1. Is it on the opposite side of the pole away from traffic? 2. Is the primary wire the only wire in the conduit? 3. For Orange and Rockland to complete the conduit installation to the top of the pole, are there any other wires (i.e., telephone, cable TV, support wires) in the way? There must not be. Has the cable been coiled and tied to the pole such that the conduit does not support it? Is the riser pipe attached to the pole with **galvanized steel** conduit straps and 3/8 inch x 3 inch (min) lag bolts? If rigid galvanized metal conduit was installed, is the pipe ground clamp and #2 AWG Cu wire attached? Has a PVC female (FA) adapter been installed at the top of the riser pipe? Transformer See Figures 6 and 11. Yes Have the three terminations indicated on the material list, to be supplied for Orange and Rockland to install at the service point, been placed in the transformer? Is each load break elbow greased with silicone and landed on its bushing? Is there enough slack in each primary cable to be removed and placed on a parking stand? Are the 2/0 AWG Cu legs of the ground grid C-crimped together inside the transformer? Is the ground grid connected to the transformer housing in the primary and secondary compartments? Are the concentric neutrals of the primary cables C-crimped to the 2/0 Cu ground grid? Is the 2/0 AWG Cu ground grid connected to the neutral (HO/XO) bushing in the secondary compartment of the transformer? Has verification of proper phasing & marking of the primary & secondary conductors been completed? INSPECTION POLICY ALL OF THE ABOVE ITEMS MUST BE COMPLETED UNLESS OTHER ARRANGEMENTS HAVE BEEN MADE. A REPEAT INSPECTION FEE WILL BE ASSESSED TO THE RESPONSIBLE PARTY FOR ANY SUBSEQUENT INSPECTIONS REQUIRED, DUE TO NON-COMPLIANCE OR NON-COMPLETION. **Comments:** Signature: Print Name: \_\_\_\_\_\_ Phone \_\_\_\_\_\_ Page 1 of 1

To schedule an inspection, fax completed checklist to 914-925-6804 or send by email to <u>Distributionengineering@oru.com</u>.

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