

STATE UNIVERSITY OF NEW YORK
COLLEGE OF TECHNOLOGY AT ALFRED

ALFRED, NEW YORK

Parking Lot 25 Expansion

Technical Specifications

100% Bid Documents

May 29, 2026

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SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Connectors, splices, and terminations rated 600 V and less.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: Indicate type, use, location, and termination locations.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

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

1. Cerro Wire LLC.
2. General Cable Technologies Corporation.
3. Okonite Company (The).
4. Southwire Company.
5. WESCO.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.

3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

E. Conductor Insulation:
1. Type THHN and Type THWN-2: Comply with UL 83.

2.2 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

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

1. 3M Electrical Products.
2. Ideal Industries, Inc.
3. ILSCO.
4. O-Z/Gedney; a brand of Emerson Industrial Automation.
5. Thomas & Betts Corporation; A Member of the ABB Group.

C. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Copper.
2. Type: One hole with standard barrels.
3. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

B. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway**.**

C. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.

D. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Finished Spaces: Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

END OF SECTION 260519

SECTION 260526 – GROUNDING & BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. This section specifies requirements for grounding.

1.2 REFERENCES

A. The following is a listing of the publications referenced in this Section:

1. American National Standards Institute (ANSI):

   a. ANSI C 2 National Electrical Safety Code

2. National Fire Protection Association (NFPA)

   a. NFPA 70 National Electrical Code
   b. NFPA 78 Lightning Protection Code

3. Underwriters Laboratories, Inc. (UL)

   a. UL 96 Lightning Protection Components
   b. UL96A Installation Requirements for Lightning Protection Systems
   c. UL 467 Grounding and Bonding Equipment

1.3 SCOPE

A. Electrical equipment and raceway grounding and bonding.

1.4 SYSTEM DESCRIPTION

A. Grounding of site lighting systems.

B. Equipment grounding for new equipment installations

1.5 SUBMITTALS

A. Shop drawings and product data for all applicants listed in Part 2 of this specification.

PART 2 PRODUCTS

2.1 GROUND RODS

A. Ground rods shall be minimum 3/4-inch diameter, copper-clad steel. Unless otherwise shown on the Contract Drawings, ground rods shall be 10-foot long.

2.2 EQUIPMENT GROUNDING CONDUCTORS

A. Equipment bonding and grounding conductors shall be copper. The conductors shall be identified by using green colored insulation.

B. Equipment foundation bolting shall not be used for grounding purposes. Separate grounding lugs or bosses shall be provided.

C. The minimum size of Equipment Grounding Conductor shall be as per NEC Table 250-95.

2.3 BELOW GRADE CONNECTIONS

A. Buried cable and ground rod connections shall be exothermic welds.

2.4 GROUNDING BUSHINGS

A. Grounding busing shall be insulated type.

PART 3 EXECUTION

3.1 INSTALLATION

A. General

1. Install grounding elements for, panelboards, and miscellaneous electrical equipment, for all non-current-carrying portions of the entire electrical system and for exposed non-electrical systems as required by ANSI C2, NFPA 70 and building codes.

B. Grounding and bonding equipment for use in connection with interior wiring systems shall conform to UL 467.

C. Ground all non-current-carrying metallic enclosures of electrical conductors, or exposed non-current-carrying metallic parts of electrical equipment, or of power apparatus.

D. All individual or isolated ground rods shall have a maximum of 25 ohms resistance to ground and if this cannot be achieved, they shall be augmented by additional ground rod(s).

E. Make all connections of grounding connector cables to ground rods by exothermic welding method.

G. Where the grounding system is a component of a lightning protection system, the installation shall conform to the requirement of NFPA 78, UL 96, and UL 96A.

F. Provide a separate, insulated equipment grounding conductor in feeder and branch circuits. Terminate each end on a grounding lug, bus or bushing.

G. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shield according to written instructions by manufacturer of

splicing and termination kits.

3.2 FIELD TESTS

A. Ground system to be tested Fall of Potential method. Submit Procedure prior to testing.

B. Make ground resistance tests at all buildings in this contract that are listed in Division 1 and at temporary transformers to ensure compliance with the requirements specified in 3.1 above, in the presence of the Engineer's representative and prepare all test results in tabulated form indicating location and time of each test and soil resistivity measured. If ground resistance on a grounding resistance test is higher than the value specified in 3.1E, contact engineer to determine proper basis to achieve compliance.

END OF SECTION 260526

SECTION 260529 – HANGARS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. RGS: Rigid Galvanized Steel conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.
2. Nonmetallic slotted support systems.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

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

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. ERICO International Corporation.
d. GS Metals Corp.
e. Thomas & Betts Corporation.
f. Unistrut; Tyco International, Ltd.
g. Wesanco, Inc.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
5. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for RGS, EMT as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, RGS may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements as applicable.

3.3 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Metal wireways and auxiliary gutters.
3. Boxes, enclosures, and cabinets.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Metal Conduit:

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

    a. AFC Cable Systems; a part of Atkore International.
    b. Allied Tube & Conduit; a part of Atkore International.
    c. O-Z/Gedney; a brand of Emerson Industrial Automation.
    d. Thomas & Betts Corporation; A Member of the ABB Group.
    e. Wheatland Tube Company.

2. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

3. GRC: Comply with ANSI C80.1 and UL 6.

4. EMT: Comply with ANSI C80.3 and UL 797.

B. Metal Fittings: Comply with NEMA FB 1 and UL 514B.

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

a. AFC Cable Systems; a part of Atkore International.
b. Allied Tube & Conduit; a part of Atkore International.
c. O-Z/Gedney; a brand of Emerson Industrial Automation.
d. Thomas & Betts Corporation; A Member of the ABB Group.
e. Wheatland Tube Company.

2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Fittings, General: Listed and labeled for type of conduit, location, and use.
4. Fittings for EMT:

a. Material: Steel.
b. Type: Setscrew.

5. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

C. Joint Compound for GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 METAL WIREWAYS AND AUXILIARY GUTTERS

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

1. B-line, an Eaton business.
2. Hoffman; a brand of Pentair Equipment Protection.
3. MonoSystems, Inc.
4. Square D.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.3 BOXES, ENCLOSURES, AND CABINETS

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

1. Crouse-Hinds, an Eaton business.
2. EGS/Appleton Electric.
3. Hoffman; a brand of Pentair Equipment Protection.

4. Hubbell Incorporated; Wiring Device-Kellems.
5. O-Z/Gedney; a brand of Emerson Industrial Automation.
6. RACO; Hubbell.
7. Spring City Electrical Manufacturing Company.
8. Thomas & Betts Corporation; A Member of the ABB Group.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

G. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

H. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

I. Gangable boxes are prohibited.

J. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

K. Cabinets - Interior:

1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

L. Cabinets - Exterior:
1. NEMA 250, Type 4x stainless steel box.
2. Hinged door
3. Internal 3-Point latch with provisions for pad lock on handle.
4. 14 gauge type 304 or 306l stainless steel enclosure.
5. Seamless gasket.
6. Bonding provision on door; grounding stud on body.
7. Rails for equipment mounting.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: GRC.
3. Underground Conduit: Refer to drawing details.

4. Boxes and Enclosures, Aboveground: NEMA 250, Type 4.

B. Indoors: Apply raceway products as specified below unless otherwise indicated.

1. Exposed, Not Subject to Physical Damage: EMT.
.
2. Exposed and Subject to Physical Damage: GRC. Raceway locations include the following:

a. Loading dock.
b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
c. To match surrounding GRC raceways.

3. Concealed in Ceilings and Interior Walls and Partitions: EMT**.**
4. Damp or Wet Locations: GRC.
5. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. EMT: Use steel compression fittings. Comply with NEMA FB 2.10.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

3.2 INSTALLATION

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

C. Do not fasten conduits onto the bottom side of a metal deck roof.

D. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

E. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

F. Arrange stub-ups so curved portions of bends are not visible above finished slab.

G. Install no more than the equivalent of three 90-degree bends in any conduit run except for communication or control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

H. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.

I. Support conduit within 12 inches of enclosures to which attached.

J. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

K. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

L. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

N. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.

O. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to bottom of box unless otherwise indicated.

P. Locate boxes so that cover or plate will not span different building finishes.

Q. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.4 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies.

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits and fittings, including GRC steel conduit.
2. Rigid nonmetallic duct.
3. Duct accessories.
4. Polymer concrete handholes and boxes with polymer concrete cover.

1.2 DEFINITIONS

A. Direct Buried: Duct or a duct bank that is buried in the ground within sand bed.

B. Duct: A single duct or multiple ducts. Duct may be either installed singly or as component of a duct bank.

C. Duct Bank:

1. Two or more ducts installed in parallel, with or without additional casing materials.
2. Multiple duct banks.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:

a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
b. Include duct entry provisions, including locations and duct sizes.
c. Include cover design.

1.4 INFORMATIONAL SUBMITTALS

A. Source quality-control reports.

B. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND FITTINGS

A. GRC: Comply with ANSI C80.1 and UL 6.

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

1. Allied Tube & Conduit; a part of Atkore International.
2. O-Z/Gedney; a brand of Emerson Industrial Automation.
3. Republic Conduit.
4. Thomas & Betts Corporation; A Member of the ABB Group.

C. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.

2.2 RIGID NONMETALLIC DUCT

A. Underground Plastic Utilities Duct: Type EPC-80-PVC and Type EPC-40-PVC RNC, complying with NEMA TC 2 and UL 651, with matching fittings complying with NEMA TC 3 by same manufacturer as duct.

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

1. CANTEX INC.
2. CertainTeed Corporation.
3. Manhattan/CDT.

C. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.

2.3 DUCT ACCESSORIES

A. Duct Spacers: Factory-fabricated, rigid, PVC interlocking spacers; sized for type and size of duct with which used, and selected to provide minimum duct spacing indicated while supporting duct during concreting or backfilling.

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

a. Allied Tube & Conduit; a part of Atkore International.
b. CANTEX INC.
c. Carlon; a brand of Thomas & Betts Corporation.
d. IPEX USA LLC.
e. PenCell Plastics.

B. Underground-Line Warning Tape: Comply with requirements for underground-line warning tape specified in Section 260553 "Identification for Electrical Systems."

2.4 POLYMER CONCRETE HANDHOLES AND BOXES WITH POLYMER CONCRETE COVER

A. Description: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.

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

1. Armorcast Products Company.
2. NewBasis.
3. Oldcastle Enclosure Solutions.
4. Quazite: Hubbell Power Systems, Inc.

C. Standard: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.

D. Color: Gray.

E. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.

F. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.

G. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

H. Cover Legend: Molded lettering, "ELECTRIC."

I. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering duct for secure, fixed installation in enclosure wall.

2.5 SOURCE QUALITY CONTROL

A. Test and inspect precast concrete utility structures according to ASTM C 1037.

B. Nonconcrete Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Strength tests of complete boxes and covers shall be by an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
2. Testing machine pressure gages shall have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate layout and installation of duct, duct bank, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify construction manager if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.

B. Coordinate elevations of duct and duct-bank entrances into handholes, and boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct and duct bank will drain to handholes and away from buildings..

3.2 UNDERGROUND DUCT APPLICATION

A. Duct for Electrical Branch Circuits: RNC Type EPC-80-PVC, direct-buried in sand or fine aggregate bed unless otherwise indicated.

B. Underground Ducts Crossing or located beneath Driveways and Roadways: RNC Type EPC-80-PVC, direct-buried in sand bed unless otherwise indicated.

C. Stub-ups: Concrete-encased GRC.

3.3 UNDERGROUND ENCLOSURE APPLICATION

A. Handholes and Boxes for 600 V and Less:
   1. Polymer concrete, SCTE 77, Tier 15 structural load rating.
   2. Cover design load shall not exceed the design load of the handhole or box.

3.4 EARTHWORK

A. Excavation and Backfill: Comply with Section 312000 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Section 329200 "Turf and Grasses."

C. Cut and patch existing pavement in the path of underground duct, duct bank, and underground structures according to "Cutting and Patching" Article in Section 017300 "Execution."

3.5 DUCT AND DUCT-BANK INSTALLATION

A. Where indicated on Drawings, install duct, spacers, and accessories into the duct-bank configuration shown. Duct installation requirements in this Section also apply to duct bank.

B. Install duct according to NEMA TCB 2.

C. Slope: Pitch duct a minimum slope of 1:300 down toward handholes and away from buildings and equipment. Slope duct from a high point to drain in both directions.

D. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 25 feet, both horizontally and vertically, at other locations unless otherwise indicated.

1. Duct shall have maximum of two 90 degree bends or the total of all bends shall be no more 180 degrees between pull points.

E. Joints: Use solvent-cemented joints in duct and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent duct do not lie in same plane.

F. Installation Adjacent to High-Temperature Steam Lines: Where duct is installed parallel to underground steam lines, perform calculations showing the duct will not be subject to environmental temperatures above 40 deg C. Where environmental temperatures are calculated to rise above 40 deg C, and anywhere the duct crosses above an underground steam line, install insulation blankets listed for direct burial to isolate the duct bank from the steam line.

G. Building Wall Penetrations: Make a transition from underground duct to GRC at least 10 feet outside the building wall, without reducing duct line slope away from the building and without forming a trap in the line. Use fittings manufactured for RNC-to-GRC transition. Install GRC penetrations of building walls as specified in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

H. Sealing: Provide temporary closure at terminations of duct with pulled cables. Seal spare duct at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.

I. Pulling Cord: Install 200-lbf-test nylon cord in empty ducts.

J. Direct-Buried Duct and Duct Bank:

1. Excavate trench bottom to provide firm and uniform support for duct. Comply with requirements in Section 312000 "Earth Moving" for preparation of trench bottoms for pipes less than 6 inches in nominal diameter.

2. Width: Excavate trench 3 inches wider than duct on each side.

3. Depth: Install top of duct at least 30 inches below finished grade unless otherwise indicated.
4. Support ducts on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.

5. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than fourspacers per 20 feet of duct. Place spacers within 24 inches of duct ends. Stagger spacers approximately 6 inches between tiers. Secure spacers to earth and to ducts to prevent floating during concreting. Tie entire assembly together using fabric

straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.

6. Install duct with a minimum of 3 inches between ducts for like services and 6 inches between power and communications duct.

7. Elbows: Install manufactured duct elbows for stub-ups, at building entrances, and at changes of direction in duct direction unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
8. Install manufactured GRC elbows for stub-ups, at building entrances, and at changes of direction in duct.
9. After installing first tier of duct, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches over duct and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in Section 312000 "Earth Moving" for installation of backfill materials.

    a. Place minimum 3 inches of sand as a bed for duct. Place sand to a minimum of 6 inches above top level of duct.

K. Underground-Line Warning Tape: Bury conducting underground line specified in Section 260553 "Identification for Electrical Systems" no less than 12 inches above all concrete-encased duct and duct banks and approximately 12 inches below grade. Align tape parallel to and within 3 inches of centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

3.6 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of duct, and seal joint between box and extension as recommended by manufacturer.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Field cut openings for duct according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.7 GROUNDING

A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, and utility structures.
2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 12-inch-long mandrel equal to duct size minus 1/4 inch. If obstructions are indicated, remove obstructions and retest.

B. Correct deficiencies and retest as specified above to demonstrate compliance.

C. Prepare test and inspection reports.

3.9 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of duct until duct cleaner indicates that duct is clear of dirt and debris. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

END OF SECTION 260543

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SECTION 260544 - SLEEVES & SLEEVE SEALS FOR ELECTRICAL RACEWAYS & CABLING

PART 1 - GENERAL

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

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

a. Advance Products & Systems, Inc.
b. CALPICO, Inc.
c. Metraflex Company (The).
d. Pipeline Seal and Insulator, Inc.
e. Proco Products, Inc.

2. Sealing Elements: Nitrile (Buna N) rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel.
4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

F. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION 260544

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.

B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1 and IEEE C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Comply with NFPA 70E and Section 260573.19 "Arc-Flash Hazard Analysis" requirements for arc-flash warning labels.

F. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

B. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.

1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
2. Colors for 208/120-V Circuits:

a. Phase A: Black.
b. Phase B: Red.
c. Phase C: Blue.

3. Colors for 240-V Circuits:

a. Phase A: Black.
b. Phase B: Red.

4. Colors for 480/277-V Circuits:

a. Phase A: Brown.
b. Phase B: Orange.
c. Phase C: Yellow.

5. Color for Neutral: White.
6. Color for Equipment Grounds: Bare copper or Green.
7. Colors for Isolated Grounds: Green with white stripe.

C. Raceways and Cables Carrying Circuits at More Than 600 V:

1. Black letters on an orange field.
2. Legend: "DANGER - CONCEALED HIGH VOLTAGE WIRING."

D. Warning Label Colors:

1. Identify system voltage with black letters on an orange background.

E. Warning labels and signs shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."

2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."
3. Arc Flash labels: in accordance with NFPA 70E.

F. Equipment Identification Labels:

1. Black letters on a white field.

2.3 LABELS

A. Self-Adhesive Wraparound Labels: Preprinted, 3-mil- (0.08-mm-) thick, vinyl flexible label with acrylic pressure-sensitive adhesive.

1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.

B. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3-mil- (0.08-mm-) thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Minimum Nominal Size:

a. 1-1/2 by 6 inches (37 by 150 mm) for raceway and conductors.
b. 3-1/2 by 5 inches (76 by 127 mm) for equipment.
c. As required by authorities having jurisdiction.

2.4 TAPES AND STENCILS

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide; compounded for outdoor use.

C. Tape and Stencil: 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers placed diagonally over orange background and are 12 inches (300 mm) wide. Stop stripes at legends.

D. Floor Marking Tape: 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

E. Underground-Line Warning Tape:

1. Tape:

    a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
    b. Printing on tape shall be permanent and shall not be damaged by burial operations.
    c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

2. Color and Printing:

    a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
    b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
    c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".

    d. Reinforced, detectable three-layer laminate, consisting of a printed pigmented woven scrim, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
    e. Width: 3 inches (75 mm).
    f. Overall Thickness: 8 mils (0.2 mm).
    g. Foil Core Thickness: 0.35 mil (0.00889 mm).
    h. Weight: 34 lb/1000 sq. ft. (16.6 kg/100 sq. m).
    i. Tensile according to ASTM D 882: 300 lbf (1334 N) and 12,500 psi (86.1 MPa).

2.5 TAGS

A. Nonmetallic Preprinted Tags: Polyethylene tags, 0.023 inch (0.58 mm) thick, color-coded for phase and voltage level, with factory printed permanent designations; punched for use with self-locking cable tie fastener.

2.6 SIGNS

A. Metal-Backed Butyrate Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch (1-mm) galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal Size: 10 by 14 inches (250 by 360 mm).

B. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.
2. Thickness:

    a. For signs up to 20 sq. in. (129 sq. cm), minimum 1/16 inch (1.6 mm) thick.

b. For signs larger than 20 sq. in. (129 sq. cm), 1/8 inch (3.2 mm) thick.

c. Engraved legend with black letters on white face.
d. Self-adhesive.
e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.7 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D 638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black, except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D 638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black.

2.8 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

G. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

H. System Identification for Raceways and Cables over 600 V: Identification shall completely encircle cable or conduit. Place adjacent identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

I. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

J. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer.

K. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

L. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:

1. “LIGHTING”
2. "POWER."

M. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.

N. Self-Adhesive Labels:

1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.

O. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.

P. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.

1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

Q. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

R. Underground Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.

2. Limit use of underground-line warning tape to direct-buried cables.
3. Install underground-line warning tape for direct-buried cables and cables in raceways.

S. Nonmetallic Preprinted Tags:

1. Place in a location with high visibility and accessibility.
2. Secure using UV-stabilized cable ties.

T. Metal-Backed Butyrate Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use labels 2 inches (50 mm) high.

U. Laminated Acrylic or Melamine Plastic Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use labels 2 inches (50 mm) high.

V. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.3 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

C. Accessible Raceways, 600 V: Self-adhesive labels.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

D. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 60 A and 120 V to Ground: Identify with self-adhesive raceway labels.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

E. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:

1. "LIGHTING."
2. "POWER."

F. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use self-adhesive wraparound labels or self-adhesive vinyl tape to identify the phase.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

G. Power-Circuit Conductor Identification, More Than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic preprinted tags colored and marked to indicate phase, and a separate tag with the circuit designation.

H. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with the conductor or cable designation, origin, and destination.

I. Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive labels with the conductor designation.

J. Auxiliary Electrical Systems Conductor Identification: Self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.

K. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

L. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.

M. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels.

1. Apply to exterior of door, cover, or other access.
2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:

a. Power-transfer switches.
b. Controls with external control power connections.

N. Operating Instruction Signs: Laminated acrylic or melamine plastic signs.

O. Emergency Operating Instruction Signs: Laminated acrylic or melamine plastic signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer.

P. Equipment Identification Labels:

1. Indoor Equipment: Laminated acrylic or melamine plastic sign.
2. Outdoor Equipment: Laminated acrylic or melamine sign.
3. Equipment to Be Labeled:

a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a self-adhesive, engraved laminated acrylic or melamine label.
b. Enclosures and electrical cabinets.
c. Access doors and panels for concealed electrical items.
d. Contactors.
e. Manhole and handhole conduit entrance/exits

END OF SECTION 260553

SECTION 265613 - LIGHTING POLES AND STANDARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Poles and accessories for support of luminaires.

1.2 DEFINITIONS

A. EPA: Equivalent projected area.

B. Luminaire: Complete luminaire.

C. Pole: Luminaire-supporting structure.

D. Standard: See "Pole."

1.3 ACTION SUBMITTALS

A. Product Data: For each pole and accessory.

B. Shop Drawings:

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Detail fabrication and assembly of poles and pole accessories.
4. Foundation construction details, including material descriptions, dimensions, anchor bolts, support devices, and calculations, signed and sealed by a professional engineer licensed in the state of installation.
5. Anchor bolt templates keyed to specific poles and certified by manufacturer.
6. Method and procedure of pole installation. Include manufacturer's written installations.

1.4 INFORMATIONAL SUBMITTALS

A. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements according to AASHTO LTS-6-M and that load imposed by luminaire and attachments has been included in design. The certification shall be based on design calculations signed and sealed by a professional engineer.

B. Material test reports.

C. Field quality-control reports.

D. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data for pole-mounted accessories.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of pole(s) that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within a specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs from special warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Characteristics: Comply with AASHTO LTS-6-M.

B. Dead Load: Weight of luminaire and its horizontal and vertical supports, and supporting structure, applied according to AASHTO LTS-6-M.

C. Ice Load: Load of 3 lbf/sq. ft., applied according to AASHTO LTS-6-M for applicable areas on the Ice Load Map.

D. Wind Load: Pressure of wind on pole and luminaire, calculated and applied according to AASHTO LTS-6-M.

1. Basic wind speed for calculating wind load for poles 50 feet high or less is 109 mph.

E. Strength Analysis: For each pole, add 2.5 to the actual EPA to account for pole attachments, then multiply by a factor of 1.1 to obtain the EPA to be used in pole selection strength analysis.

F. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

2.2 ALUMINUM POLES – POLE ARM MOUNTING TYPE

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

1. Hadco
2. Cooper Lighting, an Eaton business.
3. Gardco

4. US Architectural.

B. Poles: Seamless, extruded structural tube complying with ASTM B 221, Alloy 6063-T6, with access handhole in pole wall.

1. Shape: Round, tapered.
2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

C. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

D. Grounding and Bonding Lugs: Bolted 1/2-inch threaded lug, complying with requirements in Section 260526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

E. Fasteners: Galvanized steel, size and type as determined by manufacturer. Corrosion-resistant items compatible with support components.

1. Materials: Compatible with poles and standards as well as to substrates to which poles and standards are fastened and shall not cause galvanic action at contact points.
2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.

F. Handhole: Oval shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws.

G. Powder-Coat Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair powder coat bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, according to SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
2. Powder coat shall comply with AAMA 2604.

a. Electrostatic applied powder coating; single application with a minimum 2.5- to 3.5-mils dry film thickness; cured according to manufacturer's instructions. Coat interior and exterior of pole for equal corrosion protection.
b. Color: Refer to Luminaire Schedule on drawings.

2.3 ALUMINUM POLES – DECORATIVE POST TOP MOUNTING TYPE

A. Manufacturers: Provide products by the following:

1. Beacon
2. Luminis
3. Sun Valley
4. Approved equal

B. Poles: One piece cast aluminum with access handhole in pole wall.

1. Shape: Round, tapered. 12 evenly spaced vertical flutes, 7-inch butt tapering to 4-inch top. Circumferentially welded to base.
2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

C. Grounding and Bonding Lugs: Bolted 1/2-inch threaded lug, complying with requirements in Section 260526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

D. Fasteners: Galvanized steel, size and type as determined by manufacturer. Corrosion-resistant items compatible with support components.

1. Materials: Compatible with poles and standards as well as to substrates to which poles and standards are fastened and shall not cause galvanic action at contact points.
2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.

E. Handhole: Oval shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws.

F. Powder-Coat Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair powder coat bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, according to SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
2. Powder coat shall comply with AAMA 2604.

a. Electrostatic applied powder coating; single application with a minimum 2.5- to 3.5-mils dry film thickness; cured according to manufacturer's instructions. Coat interior and exterior of pole for equal corrosion protection.
b. Color: Refer to Luminaire Schedule on drawings.

2.4 POLE ACCESSORIES

A. Base Covers: Manufacturers' standard metal units, finished same as pole, and arranged to cover pole's mounting bolts and nuts.

B. In-line fuses in pole base.

2.5 MOUNTING HARDWARE

A. Anchor Bolts: Manufactured to ASTM F 1554, Grade 55, with a minimum yield strength of 55,000 psi.

1. Galvanizing: Hot dip galvanized according to ASTM A 153, Class C.

B. Nuts: ASTM A 563, Grade A, Heavy-Hex

1. Galvanizing: Hot dip galvanized according to ASTM A 153, Class C.
2. Four nuts provided per anchor bolt , shipped with nuts pre-assembled to the anchor bolts.

C. Washers: ASTM F 436, Type 1.

1. Galvanizing: Hot dip galvanized according to ASTM A 153, Class C.
2. Two washers provided per anchor bolt.

2.6 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 POLE FOUNDATION

A. Pre-Cast Foundations: Factory fabricated, with structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to ASTM A 123/A 123M; and with top-plate and mounting bolts to match pole-base flange and strength required to support pole, luminaire, and accessories. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

B. Anchor Bolts: Install plumb using manufacturer-supplied template, uniformly spaced.

3.2 POLE INSTALLATION

A. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in the Project Plans.

B. Foundation-Mounted Poles: Mount pole with leveling nuts and tighten top nuts to torque level according to pole manufacturer's written instructions.

C. Poles and Pole Foundations Set in Concrete-Paved Areas: Install poles with a minimum 6-inch-wide, unpaved gap between the pole or pole foundation and the edge of the adjacent concrete slab. Fill unpaved ring with pea gravel. Insert material to a level 1 inch below top of concrete slab.

D. Raise and set pole using web fabric slings (not chain or cable) at locations indicated by manufacturer.

3.3 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum using insulating fittings or treatment.

B. Steel Conduits: Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50-percent overlap.

3.4 GROUNDING

A. Ground Metal Poles and Support Structures: Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole unless otherwise indicated.
2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

END OF SECTION 265613

SECTION 265619 - LED EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Luminaire types.
2. Materials.
3. Finishes.
4. Luminaire support components.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color rendering index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaire.
4. Lamps, include life, output (lumens, CCT, and CRI), and energy-efficiency data.

5. When requested, photometric data and adjustment factors based on laboratory tests, complying with IES Lighting Measurements Testing and Calculation Guides, of each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project.

a. Manufacturer's Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the NVLAP for Energy Efficient Lighting Products.
b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

6. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Samples: For each luminaire and for each color and texture indicated with factory-applied finish.

D. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Glass, Acrylic, and Plastic Lenses, Covers, and Other Optical Parts: Furnish 5 of each type and rating installed.
2. Diffusers and Lenses: Furnish 5 of each type and rating installed.
3. Globes and Guards: Furnish 5 of each type and rating installed.

1.7 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications:

1. Luminaire manufacturers' laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
2. Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited

under the NVLAP for Energy Efficient Lighting Products and complying with applicable IES testing standards.

B. Provide luminaires from a single manufacturer for each luminaire type.

C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

D. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

1.9 FIELD CONDITIONS

A. Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.

B. Mark locations of exterior luminaires for approval by Engineer or Owner's Representative prior to the start of luminaire installation.

1.10 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including luminaire support components.
b. Faulty operation of luminaires and accessories.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: 2 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. UL Compliance: Comply with UL 1598 and listed for wet location.

D. CRI of minimum 80, CCT of 3,500 K, unless otherwise specified.

E. L70 lamp life of 50,000 hours.

F. Internal driver.

G. Nominal Operating Voltage: Universal voltage 120 – 277 volt.

H. In-line Fusing: Separate in-line fuse for each luminaire.

I. Lamp Rating: Lamp marked for outdoor use.

J. Source Limitations:

1. Obtain luminaires from single source from a single manufacturer.
2. For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.2 LUMINAIRE TYPES

A. Area and Site: As scheduled on the contract drawings.

B. Manufacturers:

1. Basis-of-Design: See contract drawings
2. Additional manufacturers will be considered if meeting the performance and aesthetic requirements of basis-of-design fixtures. Acceptable manufacturers included:

    a. Luminis
    b. Cooper
    c. Lumca
    d. Approved equals.

3. If additional manufacturers are used, photometric plans shall be submitted for review by the engineer to confirm products are equal in lighting levels and distribution. Photometrics shall be produced in AGI32 or other approved lighting software.

2.3 MATERIALS

A. Metal Parts: Free of burrs and sharp corners and edges.

B. Sheet Metal Components: Corrosion-resistant aluminum, Stainless steel, Epoxy-coated steel as per manufacturer specified. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.

D. Diffusers and Globes:

1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

2. Glass: Annealed crystal glass unless otherwise indicated.

3. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

F. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

G. Housings:

1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
2. Provide filter/breather for enclosed luminaires.

H. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage and coating.
c. CCT and CRI for all luminaires.

2.4 FINISHES

A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.
3. Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
4. Class I, Color-Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker), complying with AAMA 611.

    a. Color: Per fixture schedule on contract drawings.

D. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

    a. Color:

        1) As indicated on lighting fixture schedule on contract drawings.

2.5 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.

C. Examine walls, roofs, and site for suitable conditions where luminaires will be installed.

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

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Comply with NECA 1.

B. Use fastening methods and materials selected to resist forces defined for the application and approved by manufacturer.

C. Install lamps in each luminaire.

D. Fasten luminaire to structural support.

E. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Support luminaires without causing deflection of finished surface.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

F. Wiring Method: Install cables in raceways. Conceal raceways and cables.

G. Install luminaires level, plumb, and square with finished grade unless otherwise indicated. Install luminaires at height and aiming angle as indicated on Drawings.

H. Coordinate layout and installation of luminaires with other construction.

I. Adjust luminaires that require field adjustment or aiming.

J. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.3 INSTALLATION OF INDIVIDUAL GROUND-MOUNTED LUMINAIRES

A. Aim as indicated on Drawings.

B. Install on concrete base with top 6 inches above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 033000 "Cast-in-Place Concrete."

3.4 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.6 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

C. Illumination Tests:

1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):

a. IES LM-5.
b. IES LM-50.
c. IES LM-52.
d. IES LM-64.
e. IES LM-72.

2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

D. Luminaire will be considered defective if it does not pass tests and inspections.

E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain luminaires.

3.8 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Owner’s Representative.

END OF SECTION 265619

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SECTION 310100 – MAINTENANCE OF EARTHWORK

PART 1 - GENERAL

1.1 WORK INCLUDED.

A. Project Survey and Layout. Includes construction stake-out, and maintenance of all layout points during the Project.

B. Utility Locating Service

C. Utility Test Pits

D. Off-site Disposal of Excess Soil Materials

D. Moisture and Dust Control

E. Temporary Resurfacing of Roadways

F. Restoration of existing facilities damaged as a result of this project. Items included but are not limited to: curbs, concrete walks, concrete stairs and handrails, adjacent paved areas, underground utilities, signs, and swales.

1.2 PRE-CONSTRUCTION REQUIREMENT. The Contractor shall video the entire project site and all areas that will require restoration and supply the Owner's Representative with a copy of the video on a compact disk, thumb drive, or similar data electronic storage device.

1.3 RELATED DOCUMENTS - Refer to Section 312000 (Earthmoving).

PART 2 - PRODUCTS

2.1 RESTORATION OF SURFACES. The quality of materials and the performance of work used in the restoration shall be equal to or better than the condition of each before the work began. In the event a surface or material requires restoration and the material is not specified under this Contract, the Contractor shall notify the Owner's Representative and submit to the Owner's Representative his proposed restoration plan. Such restoration shall be reviewed by the Owner's Representative.

2.2 TEMPORARY RESURFACING

A. Temporary resurfacing shall consist of crushed stone at such depth as is necessary to withstand the traffic to which it is subjected. Where concrete pavements are removed, and need to be re-opened to traffic, the broken stone shall be surfaced with "cold patch." In areas where temporary asphalt walkways are specified, the Contractor shall provide a minimum of 2 ½" of Hot Mix Asphalt Binder over 6" of crushed stone (A1) subbase material.

B. For dust protection, the Contractor shall treat all surfaces not covered with cold patch with calcium chloride (liquid or granular) as approved by the Owner's Representative.

2.3 OTHER TYPES OF PAVEMENTS AND SURFACES. All pavement other than concrete, and all gravel, crushed stone and other types of roadway surfaces, shall be replaced with new materials except where, in the opinion of the Owner's Representative, materials salvaged from stone or gravel roadways have been removed, handled, and stored in such a manner that their original quality has been maintained, in which case such salvaged materials may be used to the extent available in the lower portion of the roadway surfaces after proper screening to remove dust and other excess material.

2.4 SWALES. Any disturbed swales shall be regraded to their original grades. Swales shall be topsoiled and seeded with new materials; topsoil (free from weeds, sticks, and stones) and a seed mix consistent with the remaining lawns.

2.5 MATERIALS FOR CONSTRUCTION STAKEOUT. The Contractor shall supply all stakeout materials.

PART 3 - EXECUTION

3.1 TEMPORARY RESURFACING (AREAS OUTSIDE OF RECONSTRUCTION)

A. Immediately upon completion of refilling of the trench or excavation, the Contractor shall place a temporary pavement over all disturbed areas of the road, driveways, and other travelled places where the original surface to remain has been disturbed as a result of this project. The temporary pavement shall be of a character satisfactory in all respects and safe for public travel. The surface of the temporary pavement shall conform to the street grades. Mounding up of any material over a trench and covering the same with loose broken stone will not be considered in compliance with the above requirements.

B. The temporary pavement shall be placed and maintained by the Contractor in a safe and satisfactory condition until such time as the permanent pavement is completed. The Contractor shall immediately remove and restore to a satisfactory condition any and all such pavements as they become unsatisfactory and not in accordance with the terms and intent of the Specifications.

3.2 CONCRETE WALKS

A. Concrete walks removed in connection with or damaged as a result of construction operations under the Contract shall be replaced with new construction. Refer to Section 321313 (Portland Cement Concrete Paving).

3.3 CURBS AND GUTTERS. The Contractor shall, at their own expense, permanently repair and relay all curbs, gutters where the same have been broken, damaged, or disturbed by the Contractor in executing any of the work covered by the Contract or by or on account of said work. The Contractor shall restore the same in a manner, to a condition and with material, either new or old as required, similar and equal to what existed before the start of this project.

3.4 WORK ADJACENT TO EXISTING BUILDINGS. Contractor shall take care to protect existing building features when earthwork and soil compaction is performed near buildings. Contractor's

attention is also brought to the fact that the concrete stairs and walkways that are adjacent the MacKenzie Complex are to remain in place. Additional care and coordination with the Owner's Representative is required when working adjacent to the MacKenzie Complex.

3.5 DUST CONTROL. The Contractor shall minimize dust from disturbed soil surfaces or other materials that can cause onsite or off-site damage, health hazards, and traffic safety problems. Dusty conditions resulting from the Contractor's operations shall be corrected at no additional cost to the Owner.

3.6 UNDERGROUND FACILITIES. The Contractor shall repair or replace all disturbed underground facilities by methods approved by the Owner's Representative and regulatory agencies.

3.7 CONSTRUCTION STAKEOUT. The Contractor shall perform all construction stakeout work necessary to establish, spatially position, measure, and verify the locations of existing and proposed terrain features of the Project.

A. The following types of Survey Operations shall be performed under the direction of a New York State Licensed Land Surveyor:

1.) Location of property markers.

2.) Tie measurements to, or resetting of control points

B. The following types of Survey Operations shall be performed under the direction of a New York State Licensed Land Surveyor or New York State Licensed Professional Engineer:

1.) Establishment or reestablishment of primary or secondary control which shall be used for:
a. Establishing location for the horizontal or vertical alignment of a structure, or feature for which the coordinates or elevations are indicated on the contract drawings.
c. Establishing reference station for Global Positioning System (GPS) control work.

2.) Establishing new horizontal or vertical alignment in the field from contract control either by conventional stakeout methods or by use of automated equipment operations. If the Contractor utilizes automated equipment for stakeout, they shall coordinate their locations and grades with the Owners Representative by utilizing an acceptable benchmark method to ensure proper grading.

3.8 UTILITY LOCATING SERVICE.

Due to the fact that the majority of the underground utilities at the project site are owned by the Campus, the Contractor shall locate utilities not covered under the Dig Safely New York program. As part of this project, the Contractor shall procure the services of an Underground Utility Locator Service. Utility Locator Service (ULS) shall meet the following requirements:

- At least 5 years experience of providing underground utility location services. Firm providing Utility Locating Service shall be acceptable to the Owner.

- The ULS shall provide the equipment and competent operation required for Ground Penetrating Radar (GPR), electro-magnetic induction, as well as standard pipe and cable locating techniques.

- ULS shall review all utility plans, construction plans, and record plans that are provided by the Owner to determine the precise location of underground utilities in areas that are scheduled for excavation by the Contractor.

- Provide materials required to mark the locations of underground utilities in the field for the Contractor.

- Observe all Federal, State, and Campus Safety Regulations.

- Coordinate utility locating and marking with Utility Location that is performed as part of the Dig Safe New York (811) program.

- Record position of buried utilities and provide to the Owner's Representative.

- Contractor is advised that the underground gas utilities are not owned by the Campus, but are owned and maintained by National Fuel. Contacts for National Fuel are as follows: Kristen Jensen (e-mail: JensenK@natfuel.com); and Brett Marlatt email: marlattb@natfuel.com).

Cost of the Utility Locating Service and coordination with the gas utility will be the responsibility of the Contractor. Contractor shall notify the Utility Locating Service such that all required utility clearances are performed prior to the start of any excavation.

3.9 UTILITY TEST PITS

The Contractor shall excavate and backfill test pits in order to determine existing underground utility type, size, elevation and where utility crossings or new utility connections to existing facilities are proposed. The Contractor shall excavate and backfill test pits in a manner approved by the Owner's Representative that prevents damage to wrappings, coatings or other protective coverings, such as by hand digging, heavy machinery excavation, vacuum excavation or similar non-destructive locating equipment. The limits of the excavation shall be within 3 feet of the utility crossing and sufficient to determine existing utility type, size and/or condition. All required survey and stakeout for locating test pits and collecting utility elevation data in the field to be included in contractor's bid. Test pits locations to be determined by the Engineer and are to utilized throughout the duration of the project.

Contractor shall coordinate with the Owner's Representative regarding the location of the exposed utility. At a minimum, this effort will include the following:

- Coordinate work with Utility Locator Service.
- Installing a wood stake (nominal 2" x 4" x 24" long) into the ground, as close as possible, at a known offset from the utility.
- Measure and record the horizontal offset distance from the stake to the utility, the vertical depth from the top of stake to top of utility, the size of the exposed utility, and it's apparent material composition.
- Protect wood stake from damage.
- Backfill test pits in kind with the surrounding soils with suitable material as defined in Section 3l0513. Existing utility to be bedded and covered in kind, with Lining Material as defined in Section 310516.

Utility Test Pit Excavation work shall include the furnishing all labor, materials and equipment necessary to excavate, locate, and backfill the test pit and replace any pavement, shoulder and sidewalk courses, subbase courses, curbs, drives, lawns and other top surfaces required to complete the work.

3.10 DISPOSAL OF EXCESS SOIL MATERIALS OFF-SITE

A. Disposal: All surplus satisfactory (suitable) soil, and unsatisfactory (unsuitable) soil is not to be disposed on the Campus. It will be the Contractor's responsibility to legally dispose of these materials off Owner's property.

It will be the Contractor's responsibility to coordinate a location for off-site fill materials, and ensure that the following requirements are adhered to at the off-site location (as applicable):

- Releases from Property Owners.
- Approvals and permits from the local municipality.
- Permits from the U.S. Army Corps of Engineers and NYS DEC if the fill site is near streams, wetlands, or floodplains.
- Adherence to the NYS DEC requirements for stormwater discharges from the fill site, as they apply to General Permit No. GP-0-25-001 (permit for stormwater discharges from construction activity).
- Installation of erosion and sediment control features at the fill site, and grading / stabilization of the fill site.

END OF SECTION 310100

SECTION 310513 – SOILS FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Suitable soil material for fill, backfill and embankment construction.
2. Structural Fill for various locations of backfill and embankment construction.
3. Controlled low strength material.

B. Related Sections:

1. Division 31 Section 310516 “Aggregates for Earthwork” for various stone and sand aggregates used as part of this project.
2. Division 31 Section 312000 “Earth Moving” for excavation, backfill, placement and compaction of various soil types.
3. Division 31 Section 312319 “Dewatering” for construction dewatering.
4. Division 31 Section 315000” Excavation Support and Protection” for temporary excavation support and protection systems.

1.2 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Borrow Soil: Satisfactory (suitable) soil imported from off-site for use as fill or backfill.

C. Fill: Soil materials used to raise existing grades.

D. Structural Fill: Material as defined in Section 310516, Type A11 Aggregate. On site soil materials meeting this requirement can be substituted for this use. On site material will be considered by the Owner’s Representative for substitution if the Contractor can demonstrate that on site material can be modified to meet the requirements of this material.

E. Select Granular Fill: Material as defined in Section 310516, Type A2 Aggregate. On site soil materials meeting this requirement can be substituted for this use. On site material will be considered by the Owner’s Representative for substitution if the Contractor can demonstrate that on site material can be modified to meet the requirements of this material.

F. Controlled Low Strength Material (Flowable Fill): A flowable, self-compacting, low density cementitious material which shall gain sufficient strength to be walked on and buried within a day, and which shall remain excavatable by hand tools after curing.

G. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by a geotechnical testing agency, according to ASTM D1586.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

J. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.3 SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Soil Materials (if imported from off-site).

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D2487.
2. Laboratory compaction curve according to ASTM D 1557.

1.4 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E329 and ASTM D3740 for testing indicated.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Suitable Material (Subsoil Type S-1) – Suitable (Satisfactory) Material is defined as soil material whose composition is satisfactory for embankment construction. The moisture content of the material has no bearing upon this designation. In general, any mineral (inorganic) soil, blasted or broken rock and similar materials of natural or man made (i.e. recycled) origin, including mixtures thereof, are considered suitable materials. Determination of whether a specific natural or man made material is a suitable material shall be made by the Owner's Representative on the above basis.

Furthermore, Suitable Material shall be soil that falls within Classification Groups GW, GP, GM, SW, SP, SM according to ASTM D2487 *"Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)"*, or a combination of these groups.

1. Material shall be free of rock or gravel larger than 3-inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

2. Soil classified as GM, SP or SM can be used; however, these soil types can be moisture sensitive and difficult to work with. No additional expense shall be incurred by the Owner if the Contractor chooses to use these materials and the required compaction cannot be achieved.

C. Unsuitable Material – Unsuitable Material is defined as any material containing vegetable or organic matter, such as muck, peat, organic silt, topsoil, or sod, that is not satisfactory for embankment construction. Certain man made deposits of industrial waste, toxic or contaminated materials, sludge, landfill, or other materials may also be determined to be unsuitable, based on an evaluation by the Owner's Representative.

1. Soils that are Unsuitable Material are further defined as soil within the Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D2487 *"Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)"*, or a combination of these groups.

2. Broken pieces or sections of asphalt pavement, macadam, or similar construction debris material that contains petroleum based products are also considered unsuitable for this Project.

3. The moisture content of a soil has no bearing upon the designation of a soil material as being an unsuitable or suitable soil. (Refer to Section 312000, Earthmoving).

D. Controlled Low Strength Material (CLSM) – Controlled Low Strength Material (flowable fill) shall have a compressive strength between 40 psi and 150 psi. Contractor to certify that the Controlled Low Strength Material meets the following requirements:

1. Portland Cement, Type 1 or Type 2: Shall comply with ASTM C150. Pozzolans and other cementitious materials shall comply with ASTM C618. Note that if CLSM is to be placed around ductile iron pipes, it shall not contain fly ash. If not placed near metals, Class "C" or Class "F" Fly Ash can be used.
2. Water: Use water, which is potable and free from deleterious amounts of alkali, acid, and organic materials, which would adversely affect the setting time or strength of the CLSM.
3. Aggregates: 100% passing the No. 10 sieve and a maximum of 20% passing the No. 200 sieve.
4. Do not place CLSM in temperatures less than 40° F, nor when freezing temperatures are expected with 24 hours. If these conditions cannot be met, consult with the manufacturer and determine procedures and protection necessary to ensure proper CLSM installation and curing.

E. Topsoil – Topsoil may be naturally occurring or may be manufactured. Topsoil is to meet the following requirements:

1. pH range between 5.5 and 7.6
2. Organic Content not less than 6% or more than 12% (dry weight basis).
3. Percent of topsoil (by weight) that passes through a No. 200 (75-µm) US standard sieve is 20% to 65%.

4. If naturally occurring topsoil exists on the site it shall be the surface layer of soil removed during soil stripping operations.
5. All topsoil shall be free from refuse, material toxic or otherwise deleterious to plant growth, subsoil, sod clumps, seeds or other viable propagules of invasive plants, weeds, woody vegetation and stumps, roots, brush, refuse, stones, clay lumps, or similar objects.
6. Construction and demolition debris as classified under 6 NYCRR Part 360, other than uncontaminated land clearing debris, shall not be used to manufacture or amend topsoil. Sod and herbaceous growth such as grass and non-invasive weeds need not be removed but shall be thoroughly broken up and mixed with the soil during handling or manufacturing operations.
7. Existing topsoil that is stripped is stockpiled so that it can be tested and amended by the Contractor as needed to meet the above requirements. Contractor to note the following:

   - Soil Amendments to increase organic content shall be peat moss. Peat moss shall be commercially produced, composed of the partly decomposed stems and leaves of any or several species of sphagnum moss.

   - The Contractor shall provide the Owner's Representative with a copy of the soil test results that show the overall gradation, organic content, and concentration of soil phosphorus. (Concentration of soil phosphorus will not be a basis for acceptance or rejection of the bioretention soil, but is required for the Owner's records).

PART 3 - EXECUTION

3.1 STORAGE OF SOIL MATERIALS - Refer to Section 312000 (Earthmoving).

3.2 PLACEMENT OF SOIL MATERIALS IN EMBANKMENT CONSTRUCTION

- Refer to Section 312000 (Earthmoving) for Embankment Construction.

END OF SECTION 310513

SECTION 310516 – AGGREGATES FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aggregates for subgrades for pavements and utility installation.
2. Subbase course to be placed and compacted in advance of asphalt paving.
3. Aggregate Material for pipe bedding.
4. Fine Aggregate Material for conduit bedding.
5. Underdrain Filter Stone.
6. Stone Filling (Light) for soil erosion control.

B. Related Sections:
1. Division 31 Section “Dewatering” for construction dewatering.
2. Division 31 Section “Excavation Support and Protection” for temporary excavation support and protection systems.
3. This Specification makes reference to the New York State Department of Transportation (NYSDOT) Standard Specifications, version issued January 1, 2026.

1.2 DEFINITIONS

A. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

B. Lining Course: Aggregate layer placed around and above the installed pipe or underground utility in a trench.

C. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a Portland cement concrete pavement.

D. Underdrain Filter Stone: Shall consist of crushed stone, gravel, or screened gravel (pea stone) that is similarly graded in size.

1.3 SUBMITTALS

A. Product Data: For each type of the aggregate product required, certify that the material requirements in Part 2 of this Section are met.

B. Materials Certificate: Certify that products meet or exceed the New York State Department of Transportation (NYSDOT) 2026 Standard Specifications requirements as follows:
1. Section 203-2: Materials – Select Granular Fill.
2. Section 304-2: Materials - Subbase Aggregate Course.
3. Section 605-2: Materials - Underdrains.

1.4 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work

B. Perform Work in accordance with the NYSDOT, January 1, 2026 Standard Specifications:
   1. Section 203: Select Granular Fill.
   2. Section 207: Geosynthetics.
   3. Section 304: Subbase Course.
   4. Section 605: Underdrain Filter Stone.

C. Preinstallation Conference: Conduct conference at Project site.

D. Material Test Reports: For Subbase (A1), Select Granular Fill (A2), and Bedding & Lining Course (A4) provide tests as follows:

   1. Laboratory compaction curve according to ASTM D 1557.

PART 2 - PRODUCTS

2.1 AGGREGATE MATERIALS

A. Subbase Material: Coarse Aggregate Type A1: Conforming to NYSDOT Subbase Item 304.15 optional, Type 1 Subbase. Certify that the Type A1 aggregate meets these requirements, as noted in Section 733-04 of the NYSDOT Materials Specifications.

B. Select Granular Fill: Course Aggregate Type A2 (Gravel): Conforming to the material requirements for Select Granular Fill, NYSDOT Item 203.07. Certify that the Type A2 aggregate meets these requirements as noted in Section 733-11 of the NYSDOT Materials Specifications.

C. Drainage Fill Material: Aggregate Type A3: Shall be a crushed angular washed stone that meets the material requirements as per Section 703-02 of the NYSDOT Standard Specifications for Coarse Aggregate. This material shall meet the size designation for # 2 Stone, as shown in Table 703-4 of Section 703-02 of the NYSDOT Standard Specifications.

D. Bedding and Lining Course: Aggregate Type A4: Crushed Stone; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve. Certify that the Type A4 aggregate meets these requirements.

E. Underdrain Filter Stone: Fine Aggregate Type A5: Certify that this aggregate will meet the following requirements: Natural stone; washed, free of clay, shale, organic matter; graded in accordance with ASTM C136 (or NYSDOT Underdrain Type 1, Item 605.0901); to the following limits:
   a. Minimum Size: 1/4 inch.
   b. Maximum Size: 5/8 inch.

F. Stone Filling (Fine): Aggregate Type A8: Certify and furnish materials in accordance with NYSDOT 2026 Standard Specifications for Item 620.02 (with reference to Material

Requirements included in Section 733-21 (733-2101), of the NYSDOT 2026 Standard Specifications).

G. Sand: Fine Aggregate Type A9: Certify and furnish natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter; graded in accordance with ASTM C136; within the following limits:

Sieve Size	Percent Passing
No. 4	100
No. 14	90 to 100
No. 200	0 to 5

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 STOCKPILING OF AGGREGATE MATERIALS

A. Stockpile materials on site at locations designated by and coordinated with the Owner's Representative.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate different aggregate materials with dividers or stockpile individually to prevent mixing.

D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

E. Remove stockpile at completion of work. Leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

3.3 INSTALLATION OF SUBBASE COURSE

A. Install granular subbase in accordance with NYSDOT January 1, 2026 Standard Specifications, Section 304-3 (Construction Details - Subbase Course) to compacted depth indicated in Contract Documents.

B. Place subbase course on subgrades free of mud, frost, snow, or ice.

C. Spread and place granular subbase in maximum 6-inch layers and compact to 95% modified proctor maximum density with a 10-ton minimum self propelled tandem roller.

D. Level and contour surfaces to elevations and gradients indicated in Contract Drawings.

E. If moisture content is too low, add water to assist compaction. If excess water is apparent, remove contaminated granular subbase and aerate to reduce moisture content.

F. Use mechanical tamping equipment in areas inaccessible to rolling equipment.

3.4 GRANULAR SUBBASE TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Scheduled Compacted Thickness: Within 1/4 inch.

C. Variation from True Elevation: Within 1/2 inch.

3.5 GRANULAR SUBBASE FIELD QUALITY CONTROL

A. Compaction testing will be performed in accordance with ANSI/ASTM D1556, ANSI/ASTM D1557, or ASTM D2922.

B. If tests indicate work does not meet specified requirements, remove work, replace and retest.

C. Frequency of Tests: One minimum plus one for every 5,000 sq. ft. of pavement.

3.6 PLACEMENT, GENERAL

A. Place geotextile separation fabric in accordance with Section 310519 as indicated on Drawings.

B. Place stone filling in accordance with NYSDOT 2026 Standard Specifications, Section 620-3 (Construction Details - Bank and Channel Protection) at embankment slopes as indicated on Drawings.

C. Install to thickness as indicated on Drawings.

3.7 DISPOSAL OF MATERIAL

A. Materials displaced through the use of the above operations shall be disposed of by the Contractor offsite. The cost of such clean-up and removal shall be included in the price of the materials. Refer to Specification Section 310100 for off-site disposal of excess soil materials.

END OF SECTION 310516

SECTION 310519 – GEOSYNTHETICS FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Geotextile Fabric.

1.2 DEFINITIONS

A. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

B. Geotextile Fabric: Includes Geotextile Stabilization and Geotextile Separation.

1.3 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work

B. Manufacturer's Certificate: Certify that products meet or exceed the New York State Department of Transportation (NYSDOT) 2026 Standard Specifications (1/01/2026 version) requirements as follows:
   1. Section 207-2: Materials -Geotextiles and Prefabricated Composite Drains for Structures.

C. Perform Work in accordance with the NYSDOT 2026 (1/01/2026 version) Standard Specifications:
   1. Section 207: Geotextiles and Prefabricated Composite Drains for Structures.

D. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS & SUBMITTALS

2.1 MATERIALS

A. Geosynthetic material brought to the project site shall be provided in rolls wrapped with covering for protection from mud, dirt, dust, and debris.

B. Geotextile Filter Fabric: (placed at temporary construction entrances for erosion control, and silt fence) Filter Fabric Type A shall be provided for installation at locations indicated on the drawings and as specified herein. Filter Fabric Type A shall be composed of high-tenacity polypropylene yarns, meeting the requirements of Mirafi® 500X or approved equal. The geotextile fabric shall be inert to commonly encountered chemicals; shall be resistant to mildew, rot, ultraviolet light, insects, and rodents; and shall have the indicated properties:

Physical Property	Test Method	Minimum Average Roll Value
Fabric Weight	ASTM D5261	4.0 oz / yd²
Grab Strength	ASTM D4632	200 lb
Grab Elongation	ASTM D4632	15 %
Apparent Opening Size	CW-02215	40 (U.S. Standard Sieve Size)

At geotextile separation areas where a non-woven geotextile is specified, Contractor has option to provide a material from item 2.1 C below.

C. Geotextile Separation Fabric: (place beneath roadway subbase) Shall be in accordance with the NYSDOT Approved List for Geosynthetics for Highway Construction, for the following parameters:
   1. Geotextile Separation:
      a. Meet requirements of Separation (S).
      b. Default strength class 2.

D. Geotextile Stabilization Fabric: (place beneath Heavy, Medium, and Fine Stone Fill, (Aggregate Types A6, A7, and A8). Stabilization Fabric shall be in accordance with the NYSDOT Approved List for Geosynthetics for Highway Construction for the following parameters:
   a. Meet requirements of Stabilization (ST).
   b. Default strength class 1.

   Product Submittal: Submit a geotextile fabric product that meets these requirements, and is on the NYSDOT Approved List.

2.2 SUBMITTALS AND CERTIFICATIONS

A. Submittals and Certifications required are as follows:

1. Catalog data showing that the Geotextile Filter Fabric meets the specified requirements.
2. Catalog data showing that the Geotextile Separation Fabric meets the specified requirements, as well as verification that it is a material from the NYSDOT Approved List.

   Catalog data showing that the Geotextile Stabilization Fabric meets the requirements specified, as well as verification that it is a material from the NYSDOT Approved List.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Place Geosynthetic Materials with reference to Division 31 Section 312000 “Earth Moving”.

3.2 CONSTRUCTION METHODS

A. Separation Fabric and Stabilization Fabric shall be installed in accordance with the details shown on the Contract Drawings and in accordance with the manufacturer's recommendations. Contractor shall protect fabric from exposure to sunlight during transportation and storage. After placement, the stabilization fabric shall not be left exposed for more than two weeks. Traffic or construction equipment shall not operate directly on the stabilization fabric. Seams on adjacent rolls shall be overlapped a minimum of 2 feet. Stabilization fabric which becomes torn or damaged shall be replaced or patched. The patch shall extend three feet beyond the perimeter of the torn or damaged area.

END OF SECTION 310519

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Attention is directed to the Contract and General Conditions and all Sections of Division 01 – General Requirements which are hereby made a part of the Specification.

B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Protecting existing trees to remain.
2. Removing existing trees.
3. Removing above- and below-grade site improvements.
4. Disconnecting, capping or sealing, and abandoning site utilities in place and removing site utilities.

B. Related Sections include the following:

1. Division 31 Section “Erosion and Sedimentation Controls” for erosion control.
2. Division 31 Section "Earth Moving" for soil materials, excavating, backfilling, and site grading.

1.3 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of subsoil and weeds, roots, toxic materials, or other non-soil materials.

B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.4 MATERIAL OWNERSHIP

A. Except for materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS

A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

B. Record drawings, according to Campus requirements, identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner.
2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises (Campus Facilities, as coordinated with the Owner’s Representative).

C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 31 Section "Earth Moving."

1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly flag trees and vegetation to remain or to be relocated.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE PROTECTION

A. Erect and maintain temporary fencing around tree protection zones before starting site clearing. Remove fence when construction is complete.

1. Do not store construction materials, debris, or excavated material within fenced area.
2. Do not permit vehicles, equipment, or foot traffic within fenced area.
3. Maintain fenced area free of weeds and trash.

B. Do not excavate within tree protection zones, unless otherwise indicated.

C. Where excavation for new construction is required within tree protection zones, hand clear and excavate with air spade to minimize damage to root systems.

3.4 UTILITIES

A. There is an abandoned gas line in the area of parking lot expansion (refer to Project Drawings). Contractor to perform utility test pits to confirm location and depth of the abandoned gas line. If the gas line is found to conflict with the proposed improvements, the Contractor shall coordinate with National Fuel such that the abandoned segment of gas line can be cut, capped, and removed by the Contractor. Contractor is advised that the underground gas utilities are not owned by the Campus, but are owned and maintained by National Fuel. Contacts for National Fuel are as follows: Kristen Jensen (e-mail: JensenK@natfuel.com); and Brett Marlatt email: marlattb@natfuel.com).

B. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner, Engineer and Owner’s Representative not less than four days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner’s written permission.

D. Excavate for and remove underground utilities indicated to be removed.

3.5 CLEARING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
3. Remove or grind stumps and remove roots, obstructions, and debris extending to a depth of 18 inches (450 mm) below exposed subgrade.
4. Use only hand methods for grubbing within tree protection zone.
5. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated. Areas below proposed pavements are to be filled with Type A2 Gravel.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm), and compact each layer to a density equal to adjacent original ground.

3.6 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

3.7 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

1. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

END OF SECTION 311000

SECTION 312000 EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Attention is directed to the Contract and General Conditions and all Sections of Division 01 – General Requirements which are hereby made a part of the Specification.

B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section.

C. Coordinate work with that of all other trades affecting or affected by work of the Section. Cooperate with such trades to assure steady progress of all work under the Contract.

1.2 SUMMARY

A. The Work of this Section includes all labor, materials, equipment and services necessary to complete the earthwork as shown on the drawings and/or specified herein, including but not necessarily limited to the following:

1. Laying out and staking all lines and levels.
2. Preparing subgrades for slabs-on-grade, building foundations, walks, pavements, lawns, and plantings.
3. Base course for pavements.
4. Subsurface drainage backfill for walls.
5. Dewatering.
6. Pneumatic trenching (air spade) within drip line of trees to remain.
7. Preparing sub-grades for slabs-on-grade, walks, pavements, turf, grasses and plants.
8. Excavating and backfilling for buildings and structures.
9. Subsurface drainage backfill for walls and trenches.
10. Excavating and backfilling trenches for utilities and pits for buried utility structures.
11. Undercutting
12. Placement and compaction of soil fill materials for embankment construction.
13. Rock Excavation

B. Related Sections include the following:

1. Division 31 Section "Site Clearing" for temporary erosion and sedimentation control measures, site stripping, grubbing, and removal of above- and below-grade improvements and utilities.
2. Division 31 Section “Excavation and Fill for Site Utilities” for trenching and backfilling utilities.

3. Division 31 Section 310100 Maintenance of Earthwork for general earthwork provisions and underground utility locating.
4. Division 33 Sections “Storm Drainage” for utility improvements.

1.3 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Layer placed over excavated subgrade in a trench before laying a pipe.

C. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

D. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.

E. Excavation: Removal of material encountered above subgrade elevations.

1. Additional Excavation (if required): Excavation below subgrade elevations as confirmed with the Owner’s Representative. Additional excavation and replacement will be paid for according to Contract provisions for changes in the Work.
2. Bulk Excavation: Excavations more than 10 feet (3 m) in width and pits more than 30 feet (9 m) in either length or width.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by the Owner’s Representative. Unauthorized excavation, as well as remedial work directed by the Owner’s Representative, shall be without additional compensation.

F. Fill: Soils materials used to raise existing grades.

G. Rock: Rock materials in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1 cu. yd. (0.76 cu. m) for bulk excavation or ¾ cu. yd. (0.57 cu. m) for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch (1065 mm) wide, short-tip-radius rock bucket; rated at not less than 120-hp (89 kW) flywheel power with bucket-curling force of not less than 25,000 lbf (111 kN) and stick-crowd force of not less than 18,700 lbf (83 kN); measured according to SAE J-1179.
2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 210 hp (157 kW) flywheel power and developing a minimum of 45,000 lbf (200 kN) breakout force; measured according to SAE J-732.

H. Structures: Building, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subbase course: Course placed between the subgrade and a cement concrete or hot mix asphalt pavement.

J. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below base, drainage fill, or topsoil materials.

K. Utilities include on-site underground pipes, conduits, ducts, cables, and appurtenant structures.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Subbase (with sieve analysis)
2. Bedding Course (with sieve analysis)
3. Structural Fill (with sieve analysis)
4. Material submittals shall include NYSDOT approved source numbers, gradations, proctors and soundness test results. Testing to be done within 3 months of the submittal date.

B. Samples: N/A

C. Informational Submittals:

1. Laboratory compaction curve according to ASTM D1557 “Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort”.

2. Pre-excavation Photographs or Electronic Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.5 QUALITY ASSURANCE

A. Pre-excavation Conference: Conduct conference at Project site with Owner.

1.6 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities servicing facilities occupied by Owner or others unless permitted in writing by Owner’s Representative and then only after arranging to provide temporary utility services according to requirements indicated:

1. Do not proceed with utility interruptions without Owner’s Representative’s written permission.

2. Contact Dig Safely New York and the Private Utility Locator before starting site clearing or excavation operations.

3. Coordinate with Owner and utility companies to shut off services if lines are active.

4. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to the satisfaction of utility owner.

5. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.

6. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

7. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

8. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures are in place.

9. The following practices are prohibited within tree protection:

    a. Storage of construction materials, debris, or excavated material.
    b. Parking vehicles or equipment.
    c. Foot traffic.
    d. Erection of sheds or structures.
    e. Impoundment of water.
    f. Excavation or other digging unless otherwise indicated.
    g. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

10. Do not direct vehicle or equipment exhaust towards protection zones.

11. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available for excavations.

B. Satisfactory Soils (suitable): ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM or a combination of these groups symbols; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen material, vegetation, and other deleterious matter.

C. Unsatisfactory Soils (unsuitable): ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. On Site Material: All on-site material to be used as fill shall be soil or soil-rock mixture which is free from organic matter and other deleterious substances. It shall contain no rocks or lumps over 4 inches in greatest dimension.

E. Imported Fill Material: Imported fill material shall consist of clean, well-graded sand and/or gravel containing less than 15 percent by weight of materials passing a No. 200 sieve and a maximum particle size of 4 inches.

F. Backfill and Fill: Satisfactory soil materials.

G. Structural Fill: NYS DOT Type 2 or Type 4 subbase course complying with the requirements of NYS DOT 304-2.

H. Drainage Stone: Clean, sound, durable, sharp-angled fragments of rock of uniform quality and conforming to NYSDOT Material Designation 703-0201, Size Designation No. 2.

I. Subbase: NYSDOT Type 2, Crushed stone, consisting of crushed ledgerock exhibiting 100% fractured faces, adapted from NYSDOT Standard Specifications, Section 304-2.02 Subbase Course items.

J. Slab Subbase: AASHTO #57 stone with 95-100% passing a 1” sieve, 25-60% passing a ½” sieve, and less than 10% passing a No. 4 sieve.

2.2 ACCESSORIES

A. Filter Fabric: Refer to Section 310519

B. Geotextile Separation Fabric: Refer to Section 310519

2.3 PNEUMATIC EXCAVATION (AIR SPADE)

A. Pneumatic Excavating Tool: Excavation within drip line of trees to remain shall be performed through the use of a pneumatic excavation tool with the following requirements:

1. The high air velocity excavation tool shall be specifically designed to fracture, pulverize, and displace porous and semi-porous soils without harming or causing damage to tree roots,

existing subsurface utilities or other non-porous objects. The Contractor shall submit catalog cuts from the manufacturer verifying that the pneumatic excavation tool meets the following criteria:

a. Rated Operating Pressure 6.2 - 7.0 bar
b. Air Stream Velocity at Cutting Head 2,200 – 2,500 km/hr
c. Air Displacement 4,000 – 5,000 L/min

B. Air Compressor: The air compressor may be either a portable or truck-mounted unit and shall be adequately sized as required to power the pneumatic excavation tool in accordance with the manufacturer's recommendations for the pneumatic excavating tool.

C. Vacuum Truck: A vacuum truck should be used to collect excavated spoil directly from the trench or pit.

D. Containment Structure: To prevent the spread of excavated soil onto adjacent roadways and areas beyond the designated work zone limits, the Contractor shall provide a mobile structure or barrier to contain the material dislodged by the pneumatic excavation tool from the trench or pit. Timber or corrugated metal shields, tents supported on tubular frames, or other structures as approved by Landscape Architect may be used

PART 3 - EXECUTION

3.1 INSPECTION

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

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge or soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water from excavations. Maintain water levels below base of excavation to control hydrostatic pressure on subgrade soils.
2. Establish and maintain temporary drainage ditches and other diversion outside excavation limits to convey rain water and water removed from excavations to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.
3. Do not discharge sediment laden water into the adjoining storm or sanitary sewer system or open swales. Pump sediment laden water from excavations into a portable sediment tank or a high-strength, non-woven geotextile fabric bag. Size portable sediment tanks in accordance with the New York Guidelines for Urban Erosion and Sediment Control.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install a dewatering system as needed to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.4 EXPLOSIVES

A. Explosives: Do not use explosives.

3.5 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

B. Stability of Excavations: Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

C. Material Storage: Stockpile satisfactory excavated materials where directed until required for backfill or fill. Place, grade and shape stockpiles for proper drainage.

1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.
2. Dispose of excess soil material and waste materials not re-used.

3.6 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended for bearing surface.

3. Excavations at Edges of Tree- and Plant-Protection Zones:
   a. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
   b. Cut and protect roots according to requirements in Division 31 Section 311000 "Site Clearing."

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

2. Use laser-beam instrument with qualified operator to establish lines and grades.

3. Owner’s Representative reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

4. Do not interfere with 45 degree bearing splay of foundations.

5. Remove water or materials that interfere with Work.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: A Minimum of 12 inches each side of pipe or conduit, as shown on the Project Details.

C. Trench Bottoms: Excavate trenches 12 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe. Remove projecting stones and sharp objects along trench subgrade.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. When Project conditions permit, slope side walls of excavation starting 2 feet above top of pipe. When side walls cannot be sloped, provide sheeting and shoring to protect excavation as specified in Division 31 Section "Excavation Support and Protection."

E. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by Owner's Representative until suitable material is encountered.

F. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Fill Type A1 and compact to density equal to or greater than requirements for subsequent backfill material.

G. Perform excavation within 24 inches of existing utility service in accordance with utility's requirements.

H. Do not advance open trench more than 100 feet ahead of installed pipe.

2.8 EXCAVATION FOR WALKS AND PAVEMENTS

Excavate surfaces under walks and pavements to indicated cross section, elevations, and grades.

2.9 APPROVAL OF SUBGRADE

A. When excavation has reached required subgrade elevations, notify Owner and Engineer who will make an inspection of conditions.

B. If the Engineer or Owner determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Proof-rolling is to be done in the presence of the project Owner's Representative (or Testing Agency) after excavation to required subgrade elevations. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction**,** repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.

2. Proof-roll with a self propelled roller in non-vibratory mode weighing at least 14,000 lbs.
    i. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Owner's Representative, and replace with compacted structural fill as directed.

b. Additional Excavation:

i. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed by the Owner's Representative. Excavation of unsuitable material must extend laterally beyond the edge of the footing or slab for a distance equal to or greater than the required depth of the excavation.
ii. Removal of unsuitable material and its replacement as directed will be paid on basis of contract conditions relative to changes in work.
iii. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect.

2. UNAUTHORIZED EXCAVATION

a. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Owner or Engineer. Unauthorized excavation, as well as remedial work directed by Owner or Engineer, shall be at Contractor's expense.

b. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Owner or Engineer.

i. Fill unauthorized excavation under other construction or utility pipe as directed by Owner.

3. STORAGE OF SOIL MATERIALS

a. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

i. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

4. BACKFILL

a. Place and compact backfill in excavations promptly, but not before completing the following:

i. Surveying locations of underground utilities for record documents.

ii. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
iii. Inspecting and testing underground utilities.
iv. Removing concrete formwork.
v. Removing trash and debris.

b. Coordinate backfilling with utilities testing.

c. Install warning tape directly above utilities, 18 inches below finished grade, except 6 inches below subgrade under pavements and slabs

5. FILL

a. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.

b. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

c. Place and compact fill material in layers to required elevations as follows:

i. Under grass and planted areas, use satisfactory soil material.
ii. Under base course for walks and pavements, use satisfactory soil material.
iii. Under footings and foundations, use Granular Base NYSDOT Type 2. Under footings and foundations, use Structural Fill to existing grade elevation.

3.12 UNDERCUTTING

A. Undercutting shall be performed only when directed by the Owner's Representative follows:

1. Muck, peat, matted roots or other yielding materials shall be removed to the depth directed by the Owner's Representative.

2. Sands and gravels that are also unsuitable materials and shall be removed to the depth directed by the Owner's Representative.

3. Materials removed during undercutting which are unsuitable for the formation of embankments shall be placed in spoil areas.

4. Undercut material shall be considered unclassified excavation.

5. Unless otherwise specified by the Owner’s Representative, undercut areas shall be replaced with Type A1 Aggregate, as described in Section 310516.

3.13 MOISTURE CONTROL

Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.

Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF BACKFILLS AND FILLS

Place backfill and fill materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

Place material on grade free of mud, frost, snow, or ice.

Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill material at 95 percent of Modified Proctor at +/- 2% optimum moisture content..
2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill material at 92 percent.
3. Under lawn or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill material at 85 percent.

For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

Utility Trench Backfill:

iv. Place material on grade free of mud, frost, snow, or ice.

v. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

vi. Trenches under Footings: Trenches are footings are not allowed.

vii. Trenches under Roadways: Backfill trenches excavated under Roadways with materials specified in the pavement section for adjacent pavement, as shown on the Contract Drawings.

viii. Place and compact initial backfill of Type A4 Aggregate - lining material, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.

ix. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

x. Place and compact final backfill of satisfactory soil to final subgrade elevation. Maintain soil within 2% of optimum moisture content to allow proper compaction.

11. Do not leave more than 50 feet of trench open at end of working day. Protect open trenches to prevent danger to the public.

3.15 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

xi. Provide a smooth transition between adjacent existing grades and new grades.

xii. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

d. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

3.16 SUBBASE COURSES

e. Place subbase course on subgrades free of mud, frost, snow, or ice.

f. On prepared subgrade, place subbase course under pavements and walks as follows:

i. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.

ii. Place subbase course material over subgrade under hot-mix asphalt pavement.

iii. Shape subbase course to required crown elevations and cross-slope grades.

iv. Place subbase course 6 inches or less in compacted thickness in a single layer.

v. Place subbase course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.

vi. Compact subbase course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

g. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.17 FIELD QUALITY CONTROL

h. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.

i. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

j. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Geotechnical Engineer.

k. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed as the following locations and frequencies:

i. Paved Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 200 sq. ft. (186 sq. m) or less of paved area, but in no case fewer than three tests.
ii. Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. or less of building slab, but in no case fewer than 3 tests.
iii. Foundation Wall Backfill: At each compacted backfill layer, at least 1 test for each 100 feet or less of wall length, but no fewer than 2 tests.
iv. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 150 feet or less of trench length, but no fewer than 2 tests.

3.19 PROTECTION

l. Protecting Graded Areas: Protect newly grades areas from traffic, freezing, and erosion. Keep free of trash and debris.

m. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

i. Scarify or remove and replace soil material to depth as directed by the Owner's Representative; reshape and recompact.

n. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

i. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

o. Protection of Persons and Property: Barricade or steel plate open excavations occurring as part of this work and post with warning lights.

i. Operate warning lights as recommended by authorities having jurisdiction.

ii. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthworks operations.

6. DISPOSAL OF SURPLUS AND WASTE MATERIALS

a. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property. Refer to Specification Section 310100.

END OF SECTION 312000

SECTION 312319 - DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes construction dewatering.

1.2 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Furnish and install a dewatering system of sufficient size and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed.

1.3 QUALITY ASSURANCE

A. Perform work in accordance with the following Sections:
   1. Section 312000: Earth Moving
   2. Section 312500: Soil Erosion and Sedimentation Control.
   3. Section 315000: Excavation Support and Protection.

B. Regulatory Requirements: Comply with New York State Department of Environmental Conservation (NYSDEC) regulations for storm water pollution control before beginning dewatering.

C. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

1. A commercially designed system manufactured specifically for the control of water.

2. A system of temporary steel sheeting, meeting the requirements of ASTM A328M. Temporary steel sheeting may be used, provided that it is in suitable condition, as determined by the Owner’s Representative.

3. Tightly sealed, impermeable sand bags may be used if demonstrated by the Contractor that it’s application will be suitable for the height of water and type of flow. Sand bags shall be of a reinforced geotextile with ties. No burlap bags shall be used. Sand of gravel may be used as the fill material in the bags. Gravel shall meet the requirements of Type A4 or A5 Aggregate, as per Section 310516. Sand shall meet the requirements of Type A9 Aggregate, as per Section 310516. All materials used for sand/gravel bags shall be double bagged, inversely inserted and each bag individually tied to prevent leakage.

4. No soil laden water shall be in the dewatering discharge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide temporary grading to facilitate dewatering and control of surface water.

B. Monitor dewatering systems continuously.

C. Protect and maintain temporary erosion and sedimentation controls, which are specified in Division 31 Section "Site Clearing" during dewatering operations.

D. Install dewatering system utilizing pump equipment, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.
   1. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.
   2. Dewatering must be done so that the velocity of the discharged water doesn't cause scouring of the receiving area.
   3. Discharge water from dewatering pumps shall not be directly discharged without treatment to remove silt and velocity from the groundwater.

E. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades.
   1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
   2. Maintain water table at least 2 ft below bottom of excavations at all times.

F. Dewatering equipment and any additional bracing shall be of adequate quality and capacity and shall be so arranged as to permit their proper functioning in connection with the cofferdam. Dewatering equipment and bracing shall be so located to permit construction of the structure in accordance with the plans.

END OF SECTION 312319

SECTION 312500 – SOIL EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1 Drawings and General Provisions of the Contract, including temporary stormwater pollution prevention for this Project apply to this Section.

1.2 WORK INCLUDED

A. Installation of Erosion Control Facilities.

B. Inspection of Erosion Control Facilities.

C. Maintenance of Erosion Control Facilities.

D. Repairs to Erosion Control Facilities.

E. Removal and disposal of temporary erosion control facilities.

1.3 REFERENCES

A. *New York Standards and Specifications for Erosion and Sediment Controls*, 2016 Version.

B. *New York State Stormwater Management Design Manual*, 2015. New York State Department of Environmental Conservation (NYS DEC).

C. *NYS DEC SPDES General Permit for Stormwater Discharges from Construction Activity,* Permit No. GP-0-25-001.

1.4 REFERENCED REQUIREMENTS

A. Local (if applicable)

B. County (if applicable)

C. State - New York State Department of Environmental Conservation (NYSDEC)

D. Federal - United States Army Corps of Engineers (USACE)

1.5 ENVIRONMENTAL REQUIREMENTS/PROTECTION OF EXISTING FACILITIES

A. Protect the following:

1. Existing storm sewers
2. Wetlands - USCOE and NYSDEC
3. Existing drainage ways

PART 2 - PRACTICES

A. Refer to New York Standards and Specifications for Erosion and Sediment Controls, 2016 Version.

B. This Project does not require a Stormwater Pollution Prevention Plan (SWPPP). However, the Contractor shall provide temporary protection measures to prevent the movement of dust or silt laden water to travel out from the limits of the project site. Temporary protection measures are

noted in the Contract Documents.

PART 3 - EXECUTION

3.1 GENERAL

A. A Construction Stormwater Pollution Prevention Plan (SWPPP) is not applicable to this Project. The Contractor is responsible for controlling sediment from leaving the project site. The Owner reserves the option to have a qualified inspector perform Stormwater inspections to ensure that temporary soil and erosion control measures are in place. Contractor to make any corrections that are noted in the Stormwater inspection reports.

B. Pollutants such as fuels, lubricants, bitumens, raw sewage, chlorine, and other harmful materials shall be handled and disposed of by approved methods and shall not be discharged into rivers, streams, impoundments, wetlands, or into natural or man-made channels leading thereto. Washwater or waste from concrete mixing or curing operations shall not be allowed to enter live streams, etc.

C. In the event of a conflict between these specification requirements and pollution control laws, rules, or regulations of other federal, state, or local agencies, the more restrictive laws, rules, or regulations shall apply.

D. In case of repeated failures on the part of the Contractor to control pollution/erosion, the right shall be reserved by the Owner to employ outside assistance to provide the necessary corrective measures. Such incurred costs, plus related engineering costs, shall be charged to the Contractor and appropriate deductions made to the Contractor's progress payments.

3.2 INSTALLATION OF EROSION CONTROL FACILITIES

A. The installation of all erosion control facilities shall be in accordance with the Project Plans, unless an alternative construction specification and installation detail has been provided or otherwise directed by the Consultant.

B. The location and method of construction of all erosion control facilities shall be the responsibility of the Contractor unless an erosion control plan and specifications are provided.

C. All erosion control facilities shall be installed prior to beginning any work unless a construction sequence has been provided. The erosion control facilities will be installed in accordance with the construction sequence unless otherwise directed by the Consultant.

3.3 MAINTENANCE OF EROSION CONTROL FACILITIES

A. Maintenance of all temporary erosion control facilities will be the Contractor's responsibility throughout the project.

B. Maintenance of all erosion control facilities must be provided after every inspection or as required. Remove excess silt and/or debris as needed during the construction of the improvements.

C. Remove and dispose of temporary erosion control facilities upon full stabilization of the Project, as confirmed with the Owner's Representative.

3.5 REPAIRS TO EROSION CONTROL FACILITIES

A. All repairs to the erosion control facilities shall be made by the Contractor at no cost to the Owner.

B. All repairs shall be made immediately upon notification by the Owner's Representative, Engineer, or when the Contractor finds an erosion control facility not properly functioning or in need of repair or maintenance.

END OF SECTION 312500

SECTION 315000 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes temporary excavation support and protection systems.

1.2 RELATED DOCUMENTS

A. 29 CFR 1926 Subpart P of “Safety and Health Regulations for Construction”, as administered by the Federal Occupational Safety and Health Administration (OSHA).

1.3 SUMMARY

A. Section includes temporary excavation support and protection systems.

B. Related Sections:

1. Division 31 Section 312000 "Earthmoving".
2. Division 31 Section 312319 "Dewatering" for dewatering system for excavations.

1.4 PERFORMANCE REQUIREMENTS

A. Design excavation support and protection system including comprehensive engineering analysis by a qualified Professional Engineer, as per Occupational Safety and Health Administration (OSHA) requirements.

B. Install and maintain excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.

C. Prevent surface water from entering excavation by grading, dikes or other means.

D. Provide all excavation support and protection necessary to install underground utility work per the project drawings, including support of existing utility tunnels, duct banks and pipes when new utility work crosses underneath / below.

1.5 INFORMATIONAL SUBMITTALS

A. Project approach and informational data to show conformance with OSHA 29 CFR 1926 Subpart P of “Safety and Health Regulations for Construction”.

B. Videotape (or video files) and photographs showing existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by the absence of, the installation of, or the performance of excavation support and protection systems. Submit before Work begins.

C. Record drawings identifying and locating capped utilities and other subsurface structural, electrical, or mechanical conditions (as applicable).

1.6 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to excavation support and protection system including, but not limited to, the following:
   a. Existing utilities and subsurface conditions.
   b. Proposed excavations.
   c. Proposed equipment.
   d. Monitoring of excavation support and protection system.
   e. Working area location and stability.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:

1. Notify Owner and Owner’s Representative no fewer than four (4) days in advance of proposed interruption of utility.
2. Do not proceed with interruption of utility without Owner's written permission.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.

C. Steel Sheet Piling: ASTM A 328/A 328M, ASTM A 572/A 572M, or ASTM A 690/A 690M; with continuous interlocks. Corners shall be roll-formed corner shapes with continuous interlock.

D. Tiebacks: Steel bars, ASTM A 722/A 722M.

E. Tiebacks: Steel strand, ASTM A 416/A 416M.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.

1. Shore, support, and protect utilities encountered.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
2. Contractor to determine the applicable type of sheeting to utilize when the protection of adjacent trees and buildings that are directly adjacent to the trenching is required, as shown on the project plans.

C. Locate excavation support and protection systems clear of permanent construction so that forming and finishing of concrete surfaces are not impeded.

D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.

E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

3.2 TRENCH SHIELDS

A. If applicable and suitable for type of work, provide a trench box or trench shield system that meets OSHA requirements.

3.3 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.

1. Fill voids immediately with approved backfill compacted to density specified in Division 31 Section 312000 "Earth Moving."
2. Repair or replace, as approved by Owner’s Representative, adjacent work damaged or displaced by removing excavation support and protection systems.

END OF SECTION 315000

SECTION 321200 - FLEXIBLE PAVING

1.1 SUMMARY

A. Section Includes:
   1. Saw cutting pavements.
   2. Hot Mix Asphalt (HMA) paving.
   3. Tack Coat

B. Related Sections:

   1. Division 31 Section “Earth Moving” for subgrade preparation.
   2. Division 31 Section "Aggregates for Earthwork" for aggregate subbase.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

   1. Job-Mix Designs: For each job mix proposed for the Work submit material product data and HMA design.

B. Manufacturer’s Certificate:
   1. Certify HMA Products meet or exceed New York State Department of Transportation (NYSDOT) 2026 Standard Specifications (1/1/26 version):
      a. Section 401: Plant Production.
      b. Section 402: Hot Mix Asphalt (HMA) Pavements.
      c. Section 407: Tack Coat

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer with NYSDOT approved materials and batch plant equipment.

B. Installer: Company specializing in performing work of this section with minimum three years experience.

C. Perform work in accordance with the following NYSDOT January 1, 2026 Standard Specifications:
   1. Section 402: HMA Pavements.
   2. Section 407: Tack Coat.

D. Mixing Plant:
   1. Obtain materials from same source throughout.
   2. Conform to the following NYSDOT January 1, 2026 Standard Specifications:
      a. Section 401: Plant Production.
      b. Section 402: Hot Mix Asphalt (HMA) Pavements.

E. Preinstallation Conference: Conduct conference at Project site.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
   1. Perform work in accordance with NYSDOT January 1, 2026 Standard Specifications, Section 402, Table 402-1 – Temperature Requirements (HMA Pavements).

PART 2 - PRODUCTS

2.1 AGGREGATES

A. Aggregate for Base, Binder, and Top Course Mix: In accordance with NYSDOT January 1, 2026 Standard Specifications: Section 401-2.02 (Aggregates).

B. Mineral Filler: Finely ground particles of limestone, hydrated lime, or other mineral dust, free of foreign matter and in accordance with NYSDOT January 1, 2026 Standard Specifications: Section 703-08 (Mineral Filler).

2.2 ASPHALT MATERIALS

A. Asphalt Binder: AASHTO MP1, PG 64-22. Refer to Part 2.4B of this Section.

B. Tack Coat: Emulsified asphalt in accordance with NYSDOT January 1, 2026 Standard Specifications Section 407-2, Materials (Tack Coat).

C. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes meeting NYSDOT January 1, 2026 Standard Specifications, Section 402-2 (Materials – HMA Pavements) for each pavement course and complying with the following requirements:

   1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
   2. Hot Mix Asphalt (HMA) Mixes to be placed at thickness noted on the plans.

   3. SuperPave Base HMA: NYSDOT Item 402.258903. 25 mm Nominal Maximum Aggregate Size, with F3 (low volume road) coarse aggregate friction requirement.

   4. SuperPave Binder HMA: NYSDOT Item 402.198903. 19.0 mm Nominal Maximum Aggregate Size, with F3 (low volume road) coarse aggregate friction requirement.

   5. SuperPave Top HMA: NYSDOT Item 402.098303. 9.5 mm Nominal Maximum Aggregate Size, with F3 (low volume road) coarse aggregate friction requirement.

D. The Performance Graded Asphalt Binder used to produce the SuperPave Hot Mix Asphalt Mixes is defined by AASHTO Provisional Standard MP-1, Standard Specification for Performance Graded Asphalt Binder.
   1. The Performance Graded Asphalt Binder shall be PG 64-22, as per NYSDOT (9/5/13) Standard Specification 702-6422.
   2. The HMA design mixtures shall be developed in accordance with the criteria specified in the SuperPave HMA Items that are appropriate for a 50-year 18-kip Equivalent Single Axle Load (ESAL) of 29,785,200.
   3. Under no circumstances shall the Performance Graded Asphalt Binder Content be less than:
      a. 5.0% for the Top Course Mix (12.5 mm aggregate)
      b. 4.0% for the Binder Course Mix (25.0 mm aggregate)

E. Crushed Gravel: When crushed gravel is to be used in the production of SuperPave Hot Mix Asphalt Mixes, the minimum percent of crushed particle shall be as follows:
   1. For particle sizes greater than 12.5 mm, 75% one crushed face.
   2. For particle sizes between 12.5 mm and 2.36 mm, 85% two crushed faces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades. Refer to Section 312000 (Earth Moving).

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

C. Prepare subbase in accordance with NYSDOT January 1, 2026 Standard Specifications: Section 304 (Subbase Course). Prior to installation of the subbase, Geotextile Separation Fabric is to be installed on the compacted subgrade.
   1. Refer to the plans for the location of the Geotextile Separation Fabric.
      a. Requirements for Geotextile Separation Fabric are specified in Division 31 Section “Geosynthetics for Earthwork.”

3.2 SAW CUTTING

A. Existing pavement and overlay shall be saw cut perpendicular to the roadway surface along neat lines, and to the depth indicated on the plans and typical sections. A power saw approved by the owner’s representative shall be used for cutting asphalt surface course and asphalt overlay. A power saw shall be used for cutting concrete pavement. After the existing asphalt pavement, concrete pavement, asphalt surface course or overlay has been saw cut through, the contractor may use pry bars, pneumatic tools or other methods approved by the owner’s representative, to pry loose the existing pavement from that pavement which is to remain. A pavement breaker, under the supervision of the owner’s representative, may be used to break up the pavement to be

removed after the pavement has been completely saw cut through and completely free from the pavement to remain.

3.3 PATCHING

A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade. Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface

3.4 TACK COAT

A. Apply tack coat in accordance with NYSDOT January 1, 2026 Standard Specifications: Section 407-3.02 (Application of Bituminous Material).

B. Apply tack coat to contact surfaces of curbs and precast drainage structures.

C. Coat surfaces of manhole and catch basin frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

D. Paving over a tack coat should not commence until the emulsion has broken (goes from brown to black) or is tacky when touched.

E. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.

F. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.5 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

B. Tack Coat: Apply in accordance with NYSDOT January 1, 2026 Standard Specifications: Section 407-3.02 (Application of Bituminous Material).

3.6 HOT-MIX ASPHALT PLACING

A. Install Work in accordance with NYSDOT January 1, 2026 Standard Specifications, Section 402-3.06: Spreading and Finishing of HMA Pavements.

B. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Spread mix at minimum temperature of 250 deg F.
2. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

C. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

D. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.7 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
3. Offset transverse joints, in successive courses, a minimum of 24 inches.

3.8 COMPACTION

A. Perform work in accordance with NYSDOT January 1, 2026 Standard Specifications, Section 402-3.07 - Compaction (HMA Pavements).

B. All vibratory compaction equipment for HMA shall be on the NYSDOT Approved List.

C. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

D. Compaction of Hot Mix Asphalt to follow the guidelines established 80 Series Compaction Methods as noted in Section 402 of the January 1, 2026 NYS DOT Standard Specifications. On the first day of paving, a test section will be established, with compaction methods determined with the Contractor and Owner’s Representative. The starting method of compaction will consist of a breakdown roller pass followed by four vibratory passes. Density readings will be taken after each roller pass to determine the project target density. This density will be used as the target density for the remainder of the project paving for that particular course of hot mix asphalt.

E. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

F. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.9 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated on the Project Plans within the following tolerances:

1. SuperPave Base Course: Plus or minus ¼ inch.
2. SuperPave Binder Course: Plus or minus ¼ inch.
3. SuperPave Top Course: Within ¼ inch.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. SuperPave Base and SuperPave Binder Course: ¼ inch for each course.
2. SuperPave Top Course: 1/8 inch.
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is ¼ inch.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.11 DISPOSAL

A. Do not clean tools and equipment used for HMA paving on the pavement surface, near streams, ponds, drainage structures, or other areas that are tributary to waterways. If a petroleum product is used for cleaning, contain all liquids products during cleaning operations using tarpaulins, sand pads, or other collection methods. Properly dispose of sand and collected petroleum products as petroleum contaminated material at no additional cost to the Owner.

END OF SECTION 321200

SECTION 321273 - PAVEMENT JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract,

1.2 SUMMARY

A. Section Includes:

1. Cold-applied joint sealants.

2. Expansion and contraction joints in asphalt and concrete pavements.

B. Related Sections:

1. Division 32 Section "Flexible Paving" for constructing joints between concrete and asphalt pavement.

2. Division 32 Section “Concrete Paving” for joints in concrete sidewalks.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each type of joint sealant and accessory, from manufacturer.

C. Manufacturer’s Installation Instructions.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for joint sealants.

1.5 QUALITY ASSURANCE

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

B. Source Limitations: Obtain each type of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.

2. When joint substrates are wet.

3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.

4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: As indicated by manufacturer's designations.

C. Cold-Applied Joint Sealants at Concrete Pavement Joints: Single Component, Nonsag, Silicone Joint Sealant for Concrete, ASTM D 5893, Type NS. Approved Products include, but are not limited to:

1. Crafco Inc., an ERGON company; RoadSaver Silicone.
2. Dow Corning Corporation; 888.
3. Pecora Corporation; 301 NS.

D. Cold-Applied Fuel Resistant Joint Sealant for Asphalt Pavements: Single Component, Pourable, Traffic-Grade, Modified-Urethane Joint Sealant for Concrete: ASTM C 920, Type S, Grade P, Class 25, for Use T. Products include, but are not limited to:

1. Pecora Corporation; Urexpan NR-200.

E. Expansion Joint Material for Concrete Sidewalks and Exterior Slabs:

1. Provide Asphalt impregnated fiberboard with bond breaker tape that meets the requirements of ASTM D1751. Material to be compatible with joint sealant material that will be placed above it.

F. Joint Sealant Backer Materials:

General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.

2.2 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

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

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install joint-sealant backings of kind indicated to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of joint-sealant backings.

2. Do not stretch, twist, puncture, or tear joint-sealant backings.

3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install joint sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place joint sealants so they directly contact and fully wet joint substrates.

2. Completely fill recesses in each joint configuration.

3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:

1. Remove excess joint sealant from surfaces adjacent to joints.

2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

G. Hot-applied joint sealants to be applied as per the manufacturer’s instructions. Only melt enough material to be poured the same day.

3.4 CLEANING

A. Clean off excess joint sealant or sealant smears adjacent to joints as the Work progresses, by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 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 Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

3.6 PAVEMENT-JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Joints within cement concrete pavement. Use Joint Sealant Material as described in Part 2.1 C of this Section.

1. Joint Location:

a. Expansion and isolation joints in cast-in-place concrete pavement and sidewalks.

b. Contraction joints in cast-in-place concrete slabs.

c. Joints between concrete sidewalk and granite curbing.

d. Other joints as indicated.

B. Joint-Sealant Application: Fuel-resistant joints at asphalt pavement. Use Joint Sealant Material as described in Part 2.1 D of this Section.

1. Joint Location:

a. Joints between concrete and asphalt pavement.

b. Joints between concrete curbs and asphalt pavement.

c. Joints between existing and proposed asphalt pavement.

d. Other joints as indicated on the project plans.

END OF SECTION 321273

SECTION 321313 – CEMENT CONCRETE PAVEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Attention is directed to the Contract and General Conditions and all Sections of Division 01 – General Requirements which are hereby made a part of the Specifications.

B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the Work of this Section.

C. Coordinate work with that of all other trades affecting or affected by work of the Section. Cooperate with such trades to assure steady progress of all work under the Contract.

1.2 SUMMARY

A. Section includes: exterior cement concrete for the following:
   1. Exterior Cement Concrete for Walkways.
   2. Cast iron detectable warning plates.

B. Related Sections include the following:
   1. Division 31 Section “Excavation and Backfilling” for subgrade preparation, grading, and base course.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixes: For each concrete pavement mix. Include alternate mix designs (subject to review by Engineer) when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
   1. Indicate amounts of water to be withheld for later addition at Project site (generally all water shall be added to transit mixer at batch plant).
   2. Provide an environmental product declaration for this material (when available), that includes the amount of embodied carbon in this building material.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

D. Samples: 10-lb (4.5-kg) samples of exposed aggregate.

E. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
1. Cementitious materials and aggregates. This must include a test performed within the previous month for Alkali-Silica Reaction in aggregates.
2. Form materials and form-release agents.
3. Steel reinforcement and reinforcement accessories.
4. Admixtures.
5. Sealing compounds.
6. Applied finish materials.
7. Adhesives and epoxies.
8. Joint fillers.
9. Joint-filler strips.
10. Repair materials.
11. Detectable warning plates.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed pavement work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

1. Manufacturer must be certified according to the National Ready Mix Concrete Association’s Plant Certification Program.

C. Testing Agency Qualifications: 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.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer’s plant and each aggregate from one source, and each admixture from the same manufacturer.

E. Welding: Qualify procedures and personnel according to AWS D1.4, “Structural Welding Code-Reinforcing Steel.”

F. ACI Publications: Comply with the following, unless more stringent provisions are indicated:

1. ACI 301, “Specification for Structural Concrete.”

2. ACI 117, “Specifications for Tolerances for Concrete Construction and Materials.”

G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixes.

H. Preinstallation Conference: Conduct conference at Project site to include Owner, Owner’s Representative, Engineer, General Contractor and Concrete Subcontractor.

1. Before submitting design mixes, review concrete mix design and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place are to attend, including the following:
   a. Contractor’s superintendent.
   b. Independent testing agency responsible for concrete design mixes.
   c. Ready-mix concrete producer.
   d. Concrete subcontractor.
2. Layout of all walkways shall be reviewed to ensure alignments as demonstrated on Contract Documents.
3. Scoring patterns and layout shall be reviewed prior to execution.
4. Build mockups in the location and of the size indicated or, if not indicated, as coordinated with the Owner’s Representative and Engineer.
5. Notify Owner and Engineer seven days in advance of dates and times when mockups will be constructed.
6. Obtain Owner’s approval of mockups before starting construction.
7. Maintain approved mockups during construction in an undisturbed condition as a standard for judging the completed pavement.
8. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY STORAGE AND HANDLING

A. Deliver, store and handle steel reinforcement to prevent bending and damage.

1.7 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities and access to the building.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

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

C. Epoxy-Coated Reinforcement Bars: ASTM A 775; with ASTM A 615, Grade 60 (Grade 420), bars.

2.2 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
   1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

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

2.3 CONCRETE MATERIALS

A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.

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

   1. Fly Ash: ASTM C 618, Class F or C.

C. Normal Weight Aggregate: ASTM C 33, uniformly graded, from a single source, as follows:
   1. Class: Severe weathering region, but not less than 3S.
   2. Nominal Maximum Aggregate Size: 1 inch (38mm) Refer to design mix.
   3. Combined Aggregate Gradation: Well graded from coarsest to finest with not more that 18 percent and not less than 10 percent retained on an individual sieve, except that less than 8 percent may be retained on sieves finer than No. 5 (0.3mm).
   4. Do not use fine or coarse aggregates containing substances that cause spalling.

D. Water: ASTM C 94.

2.4 ADMIXTURES

A. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride. Refer to design mixes.

B. Air-Entraining Admixture: ASTM C 260.

C. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

D. Water-Reducing and Retarding Admixture: ASTM C 494, Type A.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.
   1. Available Products:
      a. BurLene, by Max Katz Bag Company, Inc., http://www.maxkatzbag.com
      b. UltraCure DOTTM Disposable Wet Cure Blanket, as provided by McTech Group, Inc., http://www.mctechgroup.com
      c. conKure X80W Wet Curing Blanket, by Raven Industries, www.ravenefd.com.
      d. Approved equivalent.

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

C. Water: Potable.

D. Transparent Acrylic Water-Based Curing, Sealing and Dustproofing compound:
   1. Available Products:
      a. Masterkure N Seal W by Kure-N-Seal W by Sonneborn/BASF.
      b. Kure-N-Seal WB.
      c. Approved equivalent.

E. Evaporation Retarder: NOT PERMITTED.

F. Curing Compound: NOT PERMITTED.

2.6 RELATED MATERIALS

A. Joint-Filler Strips: ASTM D 5249, Type 2, ASTM D 1752 Expansion and Isolation Joint-Filler Strips: Ceramar, closed cell foam, available from W. R. Meadows, Inc, Hampshire, Illinois or approved equal.

B. Dowel alignment system:

   1. Products
      a. Speed Load PSD1/2x9LT, dowel sleeve in sizes for ½” x 18" dowel bar; by Greenstreak Inc, 800-325-9504, or approved equal.

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

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

      a. Kure-N-Seal W; Sonneborn, Div. Of ChemRex, Inc.
      b. Approved equivalent.

2.7 CAST IRON ADA DETECTABLE WARNING PLATES

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. Products

    a. Syracuse Castings.Product: ADA Compliant Detectable Warning Plates.
    b. Neenah Foundry. Product: R-4984.
    c. East Jordan Iron Works. Product: Duralast Detectable Warning Plates.

B. Size and shape: 24 x 24”. Provide radius products when specified along radius curbing.

C. Color: Black.

2.8 CONCRETE MIXES

A. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the trial batch method.

C. Mix Design:

    a. Compressive Strength (28 Days): 5,000 psi.
    b. Maximum W/C Ratio: 0.44.
    c. Total Cementitious Material = 680 lb/CY
    d. Slump Limit: 2 ½ inches, plus or minus 1 inch.
    e. Air Content: 6.5 percent target (range from 5.0 percent to 8.0 percent).
    f. Curing: Moist cure exposed portions with 2 coats Kure-N-Seal W AND moist cure for 7 days minimum with burlene or approved equivalent.

D. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals.

E. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

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

2.9 FABRICATING REINFORCEMENT

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

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94. Furnish batch ticket information to concrete testing representative.

1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 PREPARATION

A. Proof-roll prepared base surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

B. Remove loose material from compacted base surface immediately before placing concrete.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

3.3 FORMWORK

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

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8 inch (3mm).

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

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

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

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

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

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

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

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

3.4 REMOVING AND REUSING FORMS

A. General: Formwork that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

B. Leave formwork that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
1. Determine compressive strength of in-place concrete by testing representative field or laboratory cure test specimens according to ACI 301.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

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

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

3.5 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.
   1. Apply epoxy repair coating to uncoated or damaged surfaces of epoxy-coated reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

   1. Shop or field weld reinforcement according to AWS D1.4, where indicated.

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

E. Install welded wire fabric in whole sheets as practicable, set on chairs or supports with tie wires to hold at proper elevation. Lap adjoining pieces at least two full meshes, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

F. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch (50-mm) overlap to adjacent mats.

3.6 JOINTS

A. General: Construct construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

   1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Install so strength and appearance of concrete is not impaired, at locations indicated or approved by Engineer. Refer to drawings for details. Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.
   1. Install epoxy coated dowel bars and plastic dowel sleeves at joints.
   2. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
   3. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Locate expansion joints at intervals of 30 feet (12.192 m) as indicated on the drawings, unless otherwise indicated.
2. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than ½ inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated.

3.7 CONCRETE PLACEMENT FOR WALKS

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.

D. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery, at Project site, or during placement.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.

H. Screed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading dry-shake surface treatments.

I. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

J. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F (32 deg C). Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, reinforcement steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.8 CONCRETE FINISHING FOR WALKS

A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots, and fill low spots. Refloat surface immediately to uniform granular texture.
1. Medium broom finish: Apply nonslip medium broom finish to exterior concrete walks. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom, perpendicular to main traffic route. Coordinate required final finish with Engineer prior to application.

3.9 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.

B. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including slabs and other surfaces.

C. Cure concrete according to ACI 308.1, by the following method:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

    a. Water.
    b. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Curing Compound: Material as per the NYSDOT Approved List for Membrane Curing Compounds (711-05), Clear with fugitive dye.

3.10 SEALER

A. Exterior Sealer: Apply two (2) coats of specified sealer to exterior concrete slabs, walks, landings, steps, walls, ramps and curbs according to manufacturer’s directions. Apply uniformly in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.11 CONCRETE SURFACE REPAIRS

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

B. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than ½ inch (13 mm) in any dimension in solid concrete, but not less than 1 inch (25 mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.

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

D. Repair materials and installation not specified above may be used, subject to Owner’s approval

3.12 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:
   1. Elevation: 1/4 inch (6 mm).
   2. Thickness: Plus 3/8 inch (9 mm), minus 1/4 inch (6 mm).
   3. Surface: Gap below 10-foot-long, unleveled straightedge not to exceed 1/4 inch (6 mm).
   4. Joint Spacing: 3 inches (75 mm).
   5. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
   6. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.13 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C172 shall be performed according to the following requirements:

   1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.

      a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

   2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change. SLUMP TEST IS ONLY FOR CONSISTENCY, NOT FOR DETERMINATION OF ACCEPTABLE WATER CONTENT.
   3. Microwave Test: (AASHTO TP23) for water/cemetitious ratio in fresh concrete. This test shall be performed on each load of concrete; concrete placement may proceed while test is being performed, however concrete determined to exceed maximum w/cm ratio may not be acceptable.
   4. Air Content: ASTM C 231, pressure method, for normal weight concrete; ASTM C173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day’s pour of each type of air-entrained concrete.
   5. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
   6. Unit Weight: ASTM C567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day’s pour of each concrete mix.
   7. Compression Test Specimens: ASTM C 31/C 31M; one set of five standard cylinders for each compressive-strength test, unless otherwise indicated. Cylinders shall be molded and stored for laboratory-cured test specimens unless field-cured test specimens are required.

8. Compressive-Strength Tests: ASTM C 39;
   a. Test two field-cured specimens at 7 days and two at 28 days.
   b. A compressive strength test shall average compressive strength from two specimens obtained from the same composite sample and tested at age indicated.
9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, current operations shall be evaluated and corrective procedures shall be provided for protecting and curing in-place concrete.
10. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive compressive-strength test results equal or exceed specified compressive strength and no individual compressive-strength test result falls below specified compressive strength by more than 500 psi (3.4 MPa).

C. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in pavement, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

D. Nondestructive testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.

E. Additional Tests: At Contractor's expense, testing agency shall make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Engineer. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed by Engineer.

3.14 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.

B. Drill test cores where directed by Engineer when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 321723 - PAVEMENT MARKINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Traffic lines and pavement markings.
2. Paint.
3. Glass beads.
4. Temporary Pavement Markings.

B. Related Sections:
1. Section 321200 Flexible Paving.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
• AASHTO M247 - Standard Specification for Glass Beads Used in Traffic Paint.

B. ASTM International:
• ASTM D711 - Standard Test Method for No-Pick-Up Time of Traffic Paint.

C. New York State Department of Transportation (NYSDOT) Standard Specifications, January 1, 2026

• NYSDOT, Section 727-09 – Traffic Paint.
• NYSDOT, Section 727-05 – Glass Beads for Pavement Markings.

1.3 PERFORMANCE REQUIREMENTS

A. Paint Adhesion: Adhere to road surface forming smooth continuous film one minute after application.

B. Paint Drying: Tack free by touch so as not to require coning or other traffic control devices to prevent transfer by vehicle tires within two minutes after application.

1.4 SUBMITTALS

A. Manufacturer's Installation Instructions: Submit instructions for application temperatures, eradication requirements, application rate, line thickness, type of glass beads, bead embedment and bead application rate, and any other data on proper installation.

B. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with NYSDOT January 1, 2026 Standard Specifications, Section 640.

1.6 QUALIFICATIONS

A. Applicator: Company specializing in performing work of this section with minimum three years experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Invert containers several days prior to use when paint has been stored more than 2 months. Minimize exposure to air when transferring paint. Seal drums and tanks when not in use.

B. Glass Beads. Store glass beads in cool, dry place. Protect from contamination by foreign substances.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Conform to Manufacturer’s requirements regarding the use of products on site.

PART 2 PRODUCTS

2.1 PAINTED PAVEMENT MARKINGS

A. Furnish materials in accordance with the New York State Department of Transportation (NYSDOT) standards (Sections 640-2, and 727 of the January 1, 2026 Standard Specifications).

B. EQUIPMENT

Continuous Longitudinal Line Application Machine: Use application equipment with following capabilities.

1. Dual nozzle paint gun to simultaneously apply parallel lines of indicated width in solid or broken patterns or various combinations of those patterns.
2. Pressurized bead-gun to automatically dispense glass beads onto painted surface, at required application rate.
3. Measuring device to automatically and continuously measure length of each line placed, to nearest foot.

C. Machine Calibration:

1. Paint Line Measuring Device: Calibrate automatic line length gauges to maintain tolerance of plus or minus 25 feet per mile.
2. Cycle Length/Paint Line Length Timer: Calibrate cycle length to maintain tolerance of plus or minus 6 inches per 40 feet; calibrate paint line length to maintain tolerance to plus or minus 3 inches per 10 feet.
3. Paint Guns: Calibrate to simultaneously apply paint binder at uniform rates as specified with an allowable tolerance of plus or minus 1 mil.
4. Bead Guns: Calibrate to dispense glass beads simultaneously at specified rate. Check guns by dispensing glass beads into gallon container for predetermined fixed period of time. Verify weight of glass beads.

D. Other Equipment:

1. For application of crosswalks, intersections, stop lines, legends and other miscellaneous items by walk behind stripers, hand spray or stencil trucks, apply with equipment meeting requirements of this section. Do not use hand brushes or rollers. Optionally apply glass beads by hand.

2.2 SOURCE QUALITY CONTROL

A. Test and analyze traffic paints in accordance with ASTM D711.

PART 3 EXECUTION

3.1 EXAMINATION

A. Review layout of all pavement markings with Owner's Representative before starting work.

3.2 PREPARATION

A. Maintenance and Protection of Traffic:
   1. Provide short term traffic control.
   2. Prevent interference with marking operations and to prevent traffic on newly applied markings before markings dry.

B. Surface Preparation.
   1. Clean and dry paved surface prior to painting.
   2. Blow or sweep surface free of dirt, debris, oil, grease or gasoline.
   3. Spot location of final pavement markings as specified and as indicated on Drawings by applying pavement spots 25 feet on center.
   4. Notify Owner's Representative after placing pavement spots and minimum 3 days prior to applying traffic lines.

3.3 APPLICATION

A. Install Work in accordance with New York State Department of Transportation (NYSDOT) standards (Section 640-3 of the January 1, 2026 Specifications). Pavement markings to be placed on clean, dry pavement that has a minimum temperature of 50ºF. The ambient temperature shall be a minimum of 50ºF and rising.

B. Install paints with a minimum wet film thickness of 20 mils.

3.4 FIELD QUALITY CONTROL

A. Inspect for incorrect location, insufficient thickness, line width, coverage, retention, uncured or discolored material, and insufficient bonding.

B. Repair lines and markings, which after application and curing do not meet following criteria:
   1. Incorrect Location: Remove and replace incorrectly placed patterns.
   2. Insufficient Thickness, Line Width, Paint Coverage, Glass Bead Coverage or Retention: Prepare defective material by acceptably grinding or blast cleaning to

remove substantial amount of beads and to roughen marking surface. Remove loose particles and debris. Apply new markings on cleaned surface in accordance with this Section.

3. Uncured or Discolored Material, Insufficient Bonding: Remove defective markings in accordance with this Section and clean pavement surface one foot beyond affected area. Apply new markings on cleaned surface in accordance with this Section.

C. Replace failed or defective markings in entire section of defective markings within 30 days after notification when any of the following exists during prior to project acceptance:
   1. Average retroreflectivity within any 528 foot section is less than 1225 mcd/m2/1x for white pavement markings and 100 mcd/m2/1x for yellow pavement markings.
   2. Marking is discolored or exhibits pigment loss, and is determined to be unacceptable by three member team based on visual comparison with beaded color plates.
   3. More than 15 percent of area of continuous line, or more than 15 percent of combined area of skip lines, within any 528 foot section of roadway is missing.

3.5 PROTECTION OF FINISHED WORK

A. Protect painted pavement markings from vehicular and pedestrian traffic until paint is dry and track free. Follow manufacturer's recommendations or use minimum of 30 minutes. Consider barrier cones as satisfactory protection for materials requiring more than 2 minutes dry time.

3.6 TEMORARY PAVEMENT MARKINGS

A. Temporary pavement markings shall be provided prior to reopening lanes to two-way traffic, and prior to re-opening any parking lots up for use by the Campus. Temporary markings shall consist of:
   1. Removable pavement tape in accordance with Section 727-06 of the NYSDOT Standard Specifications (Removable Pavement Tape),
   2. Removable wet-night reflective tape in accordance with NYSDOT Section 727-07 (Removable Wet-Night Reflective Tape),
   3. Traffic paint in accordance with NYSDOT Section 727-09 Traffic Paint and NYSDOT Section 727-05 Glass Beads for Pavement Markings,
   4. Temporary overlay markers in accordance with NYSDOT Section 729-21 Temporary Overlay Markers.

B. The work for removable pavement tape, removable wet-night reflective tape, temporary overlay markers and removable raised pavement markers shall include removal. Temporary pavement markings are intended for use on any new pavement or milled surface until the subsequent course is placed or interim pavement markings or final pavement markings are installed. This includes both roadways and parking lots.

END OF SECTION 321723

SECTION 329200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Seeding.
2. Hydroseeding.
3. Erosion-control materials.

B. Related Requirements:

1. Section 310513 "Soils for Earthwork" for topsoil requirements.

1.2 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

D. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.3 PREINSTALLATION MEETINGS

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

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape Installer.

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

C. Product Certificates: For fertilizers, from manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

1.6 FIELD CONDITIONS

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of **Substantial Completion**.

1. Spring Planting: April 20 to May 30.
2. Fall Planting: August 20 to September 20.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species:

1. Quality, State Certified: State-certified seed of grass species as listed below for solar exposure.
2. Quality, Non-State Certified: Seed of grass species as listed below for solar exposure, with not less than [**85**] percent germination, not less than **95** percent pure seed, and not more than **0.5** percent weed seed:
3. Sun and Partial Shade, Cool-Season Grass: Proportioned by weight as follows:

a. 50 percent Kentucky bluegrass (Poa pratensis).

b. 30 percent chewings red fescue (Festuca rubra variety).
c. 10 percent perennial ryegrass (Lolium perenne).
d. 10 percent redtop (Agrostis alba).

2.2 FERTILIZERS

A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition:

a. **1 lb/1000 sq. ft.** of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
b. Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition:

a. 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
b. Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.3 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

B. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

C. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.

D. Asphalt Emulsion: ASTM D977, Grade SS-1; nontoxic and free of plant-growth or germination inhibitors.

2.4 EROSION-CONTROL MATERIALS

A. Do not install Erosion-Control Blankets without written permission from Owner. If Erosion Blankets are to be utilized, they shall be Biodegradable, straw, or coconut-fiber mats.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
3. Uniformly moisten excessively dry soil that is not workable or which is dusty.

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

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as reviewed with the Owner and replace with new planting soil.

3.2 PREPARATION

A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
2. Protect grade stakes set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

A. Placing Planting Soil: Place topsoil in place over exposed subgrade.

3.4 PREPARATION FOR EROSION-CONTROL MATERIALS

A. Prepare area as specified in "Turf Area Preparation" Article.

B. For erosion-control mats, install planting soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer.

C. Fill cells of erosion-control mat with planting soil and compact before planting.

D. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.

E. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.5 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds **5 mph (8 km/h)**.

1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
2. Do not use wet seed or seed that is moldy or otherwise damaged.
3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Rake seed lightly into top **1/8 inch (3 mm)** of soil, roll lightly, and water with fine spray.

C. If approved by Owner, protect seeded areas with slopes exceeding **1:6 with erosion-control fiber mesh** installed and stapled according to manufacturer's written instructions.

D. Protect seeded areas with erosion-control mats where indicated on Drawings; install and anchor according to manufacturer's written instructions.

E. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of **2 tons/acre (42 kg/92.9 sq. m)** to form a continuous blanket **1-1/2 inches (38 mm)** in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.

1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
2. Bond straw mulch by spraying with asphalt emulsion at a rate of [**10 to 13 gal./1000 sq. ft. (38 to 49 L/92.9 sq. m)**]. Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.

3.6 HYDROSEEDING

A. Hydroseeding: Mix specified seed, [**commercial fertilizer**][**slow-release fertilizer**], and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

1. Mix slurry with [**nonasphaltic**][**asphalt-emulsion**][**fiber-mulch manufacturer's recommended**] tackifier.
2. Spray-apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than

[**1500-lb/acre (15.6-kg/92.9 sq. m)** dry weight, and seed component is deposited at not less than the specified seed-sowing rate.

3. Spray-apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry coat at a rate so that mulch component is deposited at not less than [**500-lb/acre (5.2-kg/92.9 sq. m)**] dry weight, and seed component is deposited at not less than the specified seed-sowing rate. Apply slurry cover coat of fiber mulch (hydromulching) at a rate of [**1000 lb/acre (10.4 kg/92.9 sq. m)**].

3.7 TURF MAINTENANCE

A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of **3 inches.**

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
2. Water turf with fine spray at a minimum rate of **1 inch** per week unless rainfall precipitation is adequate.

C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

1. Mow [**bahiagrass**][**turf-type tall fescue**][**St. Augustinegrass**] to a height of **2 to 3 inches (50 to 75 mm)**.

3.8 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Owner:

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1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform,

close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding [**90 percent over any 10 sq. ft and bare spots not exceeding 6 by 6 inches**.

B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

3.9 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

D. Remove nondegradable erosion-control measures after grass establishment period.

3.10 MAINTENANCE SERVICE

A. Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in "Turf Maintenance" Article. Begin maintenance immediately after each area is planted and continue until acceptable turf is established, but for not less than the following periods:

1. Seeded Turf: [**60**] days from date of **Substantial Completion**.

    a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.

END OF SECTION 329200

SECTION 330500 - COMMON WORK RESULTS FOR UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Piping joining materials.
2. Piping system common requirements.

1.2 DEFINITIONS

A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.

B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 ACTION SUBMITTALS

A. As per the Material Specification.

1.4 INFORMATIONAL SUBMITTALS

A. As per the Material Specification.

PART 2 - PRODUCTS

2.1 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (3.2-mm) maximum thickness, unless otherwise indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solvent Cements for Joining Plastic Piping:

1. ABS Piping: ASTM D 2235.
2. CPVC Piping: ASTM F 493.
3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
4. PVC to ABS Piping Transition: ASTM D 3138.

E. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Install piping according to the following requirements and utilities Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping and conduit systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on the Shop Drawings.

C. Install piping and conduit indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping to permit valve servicing.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Select system components with pressure rating equal to or greater than system operating pressure.

I. Install sleeves for pipes and conduits passing through concrete and masonry walls and concrete floor and roof slabs.

1. A wall pipe or sleeve will be required for all pipe passing through concrete or masonry block walls. Wall fittings and sleeves shall be as indicated on the Drawings and as specified in the applicable piping Specification Section.

J. Work around existing Gas Mains: All work around existing gas mains shall be marked and located in advance. Utility crossings at gas lines and protocol at abandoned gas lines shall follow the information provided on the plan drawings.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and utilities sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.
3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
5. PVC Nonpressure Piping: Join according to ASTM D 2855.
6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.

E. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

F. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

G. Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

H. Concrete collars: Areas of dissimilar pipe connections or spot repairs on pipes may require an exterior concrete collar, as noted on the plan and associated detail. Concrete that is cast for the collar shall extend around the entire perimeter of the pipe, such that it will bear onto undisturbed ground below the pipe. Concrete collar detail is provided in the contract drawings.

END OF SECTION 330500

SECTION 330526 – UTILITY IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Warning Tape to be placed in all utility trenches.
   2. Tracer wire at gas lines (where applicable).

B. elated Sections:
   1. Division 31 Section 312000 “Earth Moving” for utility trench excavation.

C. Work Included:

The Work included in this section shall pertain to the identification of potable water, medium temperature water, fire protection water, chilled water supply/return and gas buried piping, underground electric, underground communication, underground oil or steam pipe buried in the site. The work shall also include but not be limited to the installation of identification/warning tape, copper tracing wire at non-ferrous utility pipes (as confirmed with the Owner’s Representative), and color coding on pipe.

PART 2 - PRODUCTS

2.1 IDENTIFICATION/WARNING TAPE

A. General: Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

   1. Potable and Fire Protection Water Main Tape:
      a. Color: Blue with Black Lettering
      b. Lettering: “CAUTION: WATER LINE BURIED BELOW” or similar wording.
   2. Gas Main Tape:
      a. Color: Yellow with Black Lettering
      b. Lettering: “CAUTION: GAS MAIN BURIED BELOW” or similar wording.
   3. Sanitary Sewer Main Tape:
      a. Color: Green with Black Lettering
      b. Lettering: “CAUTION: SANITARY LINE BURIED BELOW” or similar wording.
   4. Storm Sewer Main Tape:
      a. Color: Green with White Lettering

b. Lettering: “CAUTION: STORM LINE BURIED BELOW” or similar wording.

5. Underground Electric Tape:
   a. Color: Red with Black Lettering
   b. Lettering: “CAUTION: ELECTRIC LINE BURIED BELOW” or similar wording.

6. Telephone or Communications Tape:
   a. Color: Orange with Black Lettering
   b. Lettering: “CAUTION: COMMUNICATIONS BURIED BELOW” or similar wording.

7. Oil, MTW, or dangerous material Tape:
   a. Color: Yellow with Black Lettering
   b. Lettering: “CAUTION: (name of utility) BELOW” or similar wording.

All lettering on the warning tape shall appear legibly on the tape and shall run the entire length of the pipe.

B. TRACER WIRE FOR GAS LINES

1. In addition to providing a warning tape with an encased metallic core, all underground gas lines shall have a continuous, insulated 12 gauge solid copper wire, installed directly on top of the centerline of pipe for locating. Tracer wire shall be color coded yellow below the thermoplastic insulation recommended for direct bury. Wire connectors shall be water tight to provide electric continuity. Fasteners at structures to ground level shall be made of non corrosive material.

PART 3 – EXECUTION

3.1 INSTALLATION OF IDENTIFICATION/WARNING TAPE:

A. Install warning tape directly over the piping (both ferrous and non ferrous), as shown in the Project Drawings.

B. Install warning tape above the outside edge of the related utility structure, such that the warning tape is placed 24 inches below grade or a minimum of 12 inches above the structure. Do not embed warning tape within any asphalt or concrete pavements.

3.3 INSTALLATION OF TRACER WIRE

A. Tracer wire shall be installed along all new non-ferrous pipes and conduits, with the exception of sanitary and storm sewer lines. The wire shall be installed directly above the respective utility and shall be placed in such a manner as to be able to properly trace all utility pipe/conduits without loss or deterioration of the signal or without the transmitted signal migrating off the tracer wire.

B. Except for approved splice locations, tracer wire shall be continuous and without splices from each trace wire point.

A. For the relocated gas line by others, the Contractor shall coordinate the placement and terminal connection of tracer wire with the Utility Company. Spliced connection between the main (primary) line tracer and branch connection tracer wire shall only be allowed at the metal valve box connections. Splices shall be watertight. All splices shall get a wrapping of waterproof electrical tape.

END OF SECTION 330526

SECTION 334100 - STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Storm Drainage Pipe and fittings.
2. Underdrain Piping.

B. Related Sections:

1. Division 31 Section "Earth Moving" for excavation, trenching, and backfilling requirements.
2. Division 31 Section “Dewatering” for dewatering requirements.
3. Division 31 Section “Aggregates for Earthwork” for aggregates for backfill around pipe.
4. Division 33 Section 330500 “Common Work Results for Utilities”.

1.2 DEFINITIONS

A. HDPE: High density polyethylene plastic.

B. PE: Polyethylene plastic.

C. PVC: Polyvinyl chloride plastic

D. SICPP: Smooth interior corrugated polyethylene pipe.

E. RCP: Reinforced concrete pipe

F. UD: Perforated Corrugated Underdrain Tile

1.3 QUALITY ASSURANCE

A. Perform work in accordance with the New York State Department of Transportation (NYSDOT) January 1, 2026 Standard Specifications:

1. Section 603-3: Culverts and Storm Drains.
2. Section 605-3: Underdrains.

B. ASTM C91-89 Masonry Cement.

C. ASTM C62-89a Building Brick.

D. ASTM A48-83 (Reapproved 1990) - Gray Iron Castings.

1.4 SUBMITTALS

A. Provide manufacturers data for each type of pipe specified.

B. Manufacturer's Certificate: Certify that the HDPE pipe (SICPP) products meet or exceed AASHTO M294 requirements.

C. Manufacturer's Certificate: Certify that the PVC pipe products meet or exceed AASHTO M278 requirements.

D. Manufacturer's Certificate: Certify that the RCP pipe products (if used) meet or exceed AASHTO M 170 requirements for class II, III, IV, and V reinforced concrete pipe.

E. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Owner’s Representative no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Owner's written permission.

PART 2 - PRODUCTS

2.1 PE PIPE AND FITTINGS

A. Corrugated PE Drainage Pipe and Fittings 4” to 6” diameter (PCPUT Underdrain): AASHTO M 252M, Type S, with smooth waterway for coupling joints.

1. Soiltight Couplings: AASHTO M 252M, corrugated, matching tube and fittings.
2. Perforated corrugated polyethylene underdrain tubing and fittings: AASHTO M252, inside nominal diameter as shown on the drawings (4” and 6”).

2.2 Perforated PVC PIPE AND FITTINGS

A. Smooth walled PVC plastic pipe, fittings, and couplings, 4” and 6” diameter, for use as an underdrain outlet pipe, (when outletting to daylight). PVC underdrain outlet pipe, couplings, and fittings shall conform to AASHTO M278 Class PS46.

2.3 HDPE PIPE AND FITTINGS

A. Storm Drainage Piping (typical for storm sewer pipe, 12” diameter and up):
1. HDPE (High Density Polyethylene) Corrugated Plastic Pipe: Smooth Interior Corrugated Polyethylene Pipe: Conform to ASTM D3350 (poly pipe material), and ASTM F 405; inside nominal diameter of as shown on the Drawings, bell and spigot style rubber ring sealed gasket joint.
    a. Fittings: HDPE
    b. Standard Joints: ASTM F477, elastomeric gaskets.
    c. Silt tight Joints: Pipes installed in areas where silt tight joints are specified on the drawings shall be watertight according to the requirements of ASTM D3212. Gaskets shall meet the requirements of ASTM F477. Gaskets shall be installed by the pipe manufacturer and covered with a removeable, protective wrap to ensure the gasket is free from debris. A joint lubricant per the manufacturer shall be used on the gasket during assembly. (HDPE Pipe with silt tight joints: Hancor Bue Seal or approved equal).

2.4 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Concrete Pipes: ASTM C 443, rubber.
2. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

2.5 REINFORCED CONCRETE PIPE

A. At Locations noted on the plans. Meet Requirements of ASTM C76, plain end, and AASHTO M 170, Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe. Reinforced Concrete Pipe shall have bell and spigot type ends, with flexible water-tight elastomeric gaskets.

B. Determine class of pipe by depth of cover over pipe at rough graded elevations as follows:
1. Less than 2 feet of cover over pipe = Class V Pipe
2. 2 feet to 3 feet of cover over pipe = Class IV Pipe
3. 3 feet to 6 feet of cover over pipe = Class III Pipe
4. Over 6 feet of cover over pipe = Class II Pipe

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install pipe, fittings, and accessories in accordance with ASTM D2321. Seal joints watertight.

Lay pipe to slope gradients noted on drawings with maximum variation from indicated slope of 1/8 inch in 10 feet. The grade and alignment of each pipe shall be determined and maintained by the use of an approved laser system or approved batter boards (over the trench or parallel lines).

D. The laser system shall be operated according to the manufacturer's recommendations and safety standards. The line and grade of the laser shall be checked at not more than 50-feet away from the starting point and then periodically throughout the course of the working day. Any variation from the line and grade shall be immediately reported to the Owner’s Representative.

E. Install aggregate at sides and over top of pipe. Install top cover to minimum compacted thickness of 12 inches, compact to 95 percent, as per ASTM D1557 (refer to Section 312000 “Earth Moving”).

F. Blocking will not be permitted under the pipe.

G. No pipe shall be laid upon a foundation in which frost exists nor at any time when the Owner’s Representative shall deem that there is danger of the formation of ice or the penetration of frost at the bottom of the excavation.

H. Refer to Division 31 Section “Earth Moving” for backfilling and compacting requirements. Do not displace or damage pipe when compacting.

I. Refer to Division 33 Section “Sewer Bypass Pumping” for bypass requirements during pipe installation.

3.2 CONNECTIONS

A. Make connections to existing underground manholes or drainage structures.

1. When required, connection to existing storm sewers shall be made by connecting to the existing drainage structure without disturbing the existing storm sewer. The opening for the new pipe shall be core drilled or by a method approved by the Owner's Representative. The new pipe is to be placed at invert shown on the plans. Opening for pipe to be water tight.
2. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.3 IDENTIFICATION

A. Materials and their installation are specified in Division 33 Section 330526 "Utility Identification". Arrange for installation of warning tape directly over piping and at outside edge of underground storm sewer structures.
1. Install Drainage Outlet Markers (as described in Section 330526) at the end section outlets of proposed culvert pipes.

3.4 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping. The total leakage of any section tested shall not exceed the rate of 100 gallons per mile of pipe per 24 hours per inch of nominal pipe diameter; plus leakage allowance for manholes included in the test section. Sewer sections that fail test shall be repaired prior to retesting. A period of not less than 24 hours shall be maintained between draining of line for repair and refilling of pipeline for retesting.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Leaks and loss in test pressure constitute defects that must be repaired.

C. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.5 CLEANING

A. Clean interior of piping of dirt and superfluous materials.

END OF SECTION 334100

SECTION 334200 - MANHOLE REHABILITATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manhole / Drainage Structure rehabilitation.

B. Final inspection of completed work.

1.2 RELATED SECTIONS

1. Division 33 Section “Storm Drainage Piping”

1.3 GENERAL

A. It is the intent of this specifications to adjust and rehabilitation at the existing drainage catch basin /manhole structure at Lot 25 through elimination of infiltration/inflow, corrosion protection and/or correction of structural defects.

B. Sewer manhole cleaning shall include the removal of solids, sand, debris, roots, and any other matter from the walls, base, and flow channel of the manhole.

1. Cleaning shall be performed to the extent required by the manufacturer of the proposed rehabilitation product.

C. Frame and cover rehabilitation shall include one or more of the following:

1. Removal of existing frame and cover and installation of new frame and cover in accordance with Campus standards, as shown on the Drawings.

2. Resetting of existing frame and cover.

3. Raising existing frame and cover to grade.

4. Pavement and site rehabilitation as necessary.

* Refer to Drainage Structure Detail B1/C-501, located in the Project Drawings.

1.4 PROJECT RECORDS

A. Digital photographs showing original condition, condition following surface preparation and rehabilitated condition shall be provided to the Owner’s Representative.

1.5 REGULATORY REQUIREMENTS

A. Conform to regulatory agencies having jurisdiction over the work.

1. The Contractor shall carry out his operations in strict accordance with all applicable OSHA standards, especially those safety requirements involving working and entering in confined spaces and working near roadways.

B. Contractor must make his own arrangements for disposal of pipe removal and cleaning solids or excess material associated with the manhole rehabilitation. Contractor shall load solids into an existing dumpster.

1. Material disposal shall be in accordance with all applicable County, State, and Federal requirements.

C. Contractor shall obtain all necessary permits prior to the start of work on this contract.

1.6 COORDINATION

A. Coordinate field work under provisions of other specification sections, including maintenance of traffic, access to private driveways and easements areas, emergency vehicle access, and location of existing utilities.

1.7 SUBMITTALS

A. Prior to the start of work, the Contractor shall submit the method(s) and product(s) proposed for performing the manhole rehabilitation.

PART 2 PRODUCTS

2.1 MATERIALS – WATERPROOFING AND CORROSION PROTECTION

A. Products shall be capable of completely waterproofing and providing a structural repair of each manhole.

1. Leaks originating from pipe connections may require drilling and the injection of grout to stop infiltration sources prior to cementitious waterproofing.

2. The waterproofing product shall be a spray on, trowel on, mortar or epoxy system capable of repairing the interior of the manhole, including walls, corbel, any benches, and chimney.

3. The Contractor for the manhole rehabilitation work shall be certified by the product manufacturer as qualified to perform the rehabilitation work.

B. Design basis shall be one of the four systems listed below or approved equal. Alternate rehabilitation methods must be submitted to the Owner for approval prior to start of work.

1. Warren Environmental Services (WES) hand applied epoxy.

2. Sewpercoat Calcium Aluminate Mortar System.

3. Saueriesen F121, F170, 210RS, F180, and F88.

2.2 MATERIALS - FRAME AND COVER REPLACEMENT

A. Frames and covers shall be as manufactured by Neenah Foundry Company, East Jordan Iron Works, Syracuse Castings Sales Corporation, or approved equal.

B. Frames and covers shall conform to the following requirements; or equal:

1. Manhole frames and covers shall conform to East Jordan Iron Works (EJ) / Syracuse Casting Sales Corporation, Pattern 10128, Neenah Foundry R-1558, or equivalent.

C. Material - shall be gray cast iron conforming to ASTM Specification A-48, Class 30; or shall be ductile cast iron conforming to ASTM Specification A-536, Grade 60-40-18.

D. Castings - Shall be manufactured true to pattern and shall be of uniform quality, free from blowholes, porosity, hard spots, shrinkage distortion, or other defects. Components shall fit together in a satisfactory manner.

E. Frames and covers shall be heavy duty, non-penetrating pickhole type of non-rocking design, or shall have machined bearing surfaces to prevent rocking and rattling under traffic loads. .

F. Finish

1. Shall be smooth and well-cleaned by shot-blasting or by other approved method.

2. All surfaces shall be clean and free from rust scale, grease, oil or other impurities prior to application of one shop coat of asphalt paint.

G. Frames shall be firmly seated in full bed of mortar and be positioned to conform to the adjacent finished grade or to the specific elevation shown on the Drawings. If leveling rings are used they shall be Ladtech HDPE adjusting rings or equivalent.

H. Frames to be set parallel to surface slopes. Covers shall seat uniformly in any position in the frame without rocking.

2.3 MATERIALS - WALL AND TROUGH REPAIRS

A. Concrete used for wall rehabilitation shall be a mix designed to produce a minimum 28 day strength of 4,000 psi.

1. Maximum aggregate size per ASTM C33 shall be #57.

2. Minimum cement content shall be 575 lbs./cy.

3. Maximum water/cement ration by weight shall be 0.45.

4. Slump shall not exceed 3 inches.

5. Provide 6 percent air-entrained concrete.

B. Contractor to submit mix design prior to the start of work. Materials shall meet the following requirements:

1. Cement shall be Portland Cement Type I or Type II and shall conform to ASTM Specification C-150.

2. Fine aggregate (sand) shall be natural or manufactured siliceous sand, clean and free from deleterious substances and graded within the limits set forth in ASTM C33 in Article 5.

3. Course aggregate shall be crushed stone or crushed gravel, free from deleterious mater; graded within the limits set forth in Table 2 of ASTM C33.

4. Mixing water shall be clear, potable and free of deleterious substances. Non-potable water shall be used only if approved by Engineer. For cold weather concreting, mixing water shall be heated; for hot weather concreting, mixing water shall be cooled.

5. Admixtures may be used as necessary to increase the set time of the concrete, but must be approved by the Engineer prior to the start of work.

a. Admixtures shall be manufactured by Anti-Hydro Company; Master Builders Company, Ltd.; Sika Chemical Corporation; W.R. Grace, Inc.,; or approved equal.

PART 3 EXECUTION

3.1 EXAMINATION

A. The Contractor shall have complete responsibility to select the method(s) of repairing manholes in accordance with one of the methods outlined in these specifications.

1. The rehabilitation requirements for each manhole is located on Dwg C-501 of the project plans.

B. If the Contractor elects to use an alternate methods, they shall submit the method and materials to be used to the Engineer for approval. No increase in the price for rehabilitation will be allowed.

3.2 CLEANING REQUIREMENTS

A. All concrete and masonry surfaces must be clean. Manholes which are to receive sealing, A wall rehabilitation, and/or step removal shall be cleaned prior to further rehabilitation.

B. Grease, loose bricks, mortar, unsound concrete, roots, and other materials must be completely removed.

1. Water blasting with proper nozzles shall be the primary method of cleaning, however, other methods such as wet or dry sandblasting, acid wash, concrete cleaners, degreasers or mechanical means may be required to properly clean the surface as dictated by the manufacturer of the proposed rehabilitation product.

2. Surfaces on which these other methods are used shall be thoroughly rinsed, scrubbed, and neutralized to remove cleaning agents and their reactant products.

3. During the manhole rehabilitation process the Contract shall use extreme care to prevent material from entering the siphon barrels. If any material has entered the siphon barrels, the Contractor shall clean the barrel at no additional costs.

C. It is the Contractor's responsibility to supply the water necessary to perform the cleaning work.

1. The Contractor shall be required to obtain authorization from the Campus when the supply of water is from fire hydrants.

2. The Contractor shall be required to make good any damages resulting from the improper use of the water supply system.

3.3 WATERPROOFING AND CORROSION PROTECTION

A. All installation procedures shall meet the requirements of the specific product manufacturer, as approved by the Engineer.

B. During the periods of cold weather, Contract shall be required to maintain temperature inside the manhole above the minimum requirements of each proposed product for the duration of the rehabilitation process.

1. No admixtures or enhancing chemicals shall be added to waterproofing products without written consent of Engineer and product manufacturer.

C. The Contractor shall be responsible to maintain and protect flow through the manhole at all times.

1. Provide covering over sewer flow during spray on application if required to avoid impact on downstream facilities.

D. All manholes shall be cleaned in accordance with the requirements of Article 3.2.

E. After cleaning, all active leaks shall be stopped using a quick setting hydraulic cement mixture meeting the requirements of one of the systems listed in Article 2.1.

F. The calcium aluminate cement mortar coating or epoxy shall then be applied using an applicator meeting the requirements of the product manufacturer.

1. The coating shall be applied to the entire interior of the manhole down to the bottom of the invert in the sewer or to the flow line at the time of application.

2. Finish troweling shall be required for the trough and walls.

Active leaks around pipe connections that cannot be sealed with quick setting hydraulic cement shall be sealed by drilling holes through the manhole apron or walls followed by the pressure injection of a grout material as approved by the Owner and Engineer.

G. Final acceptance of the rehabilitated manhole shall be based upon Engineer's and Owner's inspections made in the field.

3.4 FRAME AND GRATE - COVER REPAIR/REPLACEMENT

A. The Contractor shall be responsible for obtaining all permits required prior to start of work.

B. The existing frames and covers so designated shall be removed, and disposed of by the Contractor at his expense.

C. Frames and covers shall be installed so that they are level, and flush with existing surfaces on paved areas. Frames shall extend 6-inches above grade in easement areas.

D. Where indicated, existing frames and covers shall be reset and/or raised to match existing grade using grade rings and shown on the attached details.

1. When finished, all frames and covers shall be centered over the manhole.

E. The Contractor shall perform paving and/or site restoration once covers have been replaced.

1. Pavement restoration shall be accomplished in accordance with the standards indicated on the plans and/or detail sheets included at the end of this section.

3.5 WALL AND TROUGH REHABILITATION

A. Contractor shall clean the manhole prior to work in accordance with Article 3.2.

B. After cleaning, concrete shall be installed in the manhole to the extent necessary to create a smooth flow channel.

1. Channel shall extend to the top of the pipe as shown on the detail sheet attached to the end of this section.

C. Concrete shall be placed in accordance with ACI 304 and ACI 318. Walls and troughs shall receive a hand troweled finish after installation for a thorough consolidation. The finished surface shall be essentially free of trowel marks, uniform in texture and appearance.

D. Curing and projection shall begin immediately after completion of the finishing.

1. All freshly placed concrete shall be protected from flow through the sewer line and provided with sufficient water for hydration for at least a seven day period.

E. Contractor shall be responsible for the maintenance of flow through the manhole at all times.

1. Temporary piping shall be provided as required to allow sufficient time for concrete to harden.

3.6 FINAL INSPECTION

A. Final inspection will be based on visual inspection of the sealed manhole during a period of high groundwater.

1. The Owner's Representative shall be the sole judge of the acceptability of the repairs.

2. Any defects noted shall be repaired by the Contractor at no cost to the Owner.

END OF SECTION 334200

SECTION 334413 – PRECAST CONCRETE MANHOLES AND CATCH BASINS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Precast Concrete Manholes for Storm Sewer Systems.
   2. Precast Concrete Catch Basins.
   3. Precast Concrete Manholes for Electrical and Communications.

B. Related Sections:
   1. Division 31 Section "Earth Moving" for excavation, trenching, and backfilling requirements.
   2. Division 31 Section “Dewatering” for dewatering requirements.

1.2 DEFINITIONS

A. FRP: Fiberglass-reinforced plastic.

B. HDPE: High density polyethylene plastic.

C. PE: Polyethylene plastic.

D. PVC: Polyvinyl chloride plastic

E. SICPP: Smooth interior corrugated polyethylene pipe.

1.3 QUALITY ASSURANCE

A. Perform work in accordance with the New York State Department of Transportation (NYSDOT) January 1, 2026 Standard Specifications:
   1. Section 604: Drainage Structures.
   2. Section 655: Frames, Grates and Covers.

B. NYSDOT Standard Sheets: 604-01, 604-02, 655-03, and 655-04.

C. ASTM C91-89 Masonry Cement.

D. ASTM A48-83 (Reapproved 1990) - Gray Iron Castings.

1.4 SUBMITTALS

A. Shop Drawings:

   1. Manholes: Include plans, elevations, sections, details, frames, and covers.
   2. Catch basins, stormwater inlets, and dry wells: Include plans, elevations, sections, details, frames, covers, and grates.

B. Field quality-control reports.

C. Manufacturers: Manufacturers of Precast Drainage Structures and Manholes shall appear on the NYSDOT Approved List of Precast Concrete Manufacturers for QA/QC Production (Group 2, Drainage Units). Acceptable manufacturers for precast reinforced concrete manholes and Drainage Structures include but are not limited to:

1. The Fort Miller Co., Inc.
2. Lakelands Precast, Inc
3. Binghamton Precast & Supply
4. Kistner Concrete Products

Acceptable manufacturers for manhole and catch basin frames, grates and covers shall appear on the NYSDOT Approved List and include but are not limited to:

1. Neenah Foundry Co.
2. East Jordan Iron Works (formerly Syracuse Castings Sale Corp.)
3. Campbell Foundry Co.

At all manhole covers to be placed in roadway pavements, Contractor is to furnish and install a frame and cover system that allows support by both the road surface and the drainage structure, to allow for the slope of the roadway (up to 5 degree cover angle to precast structure). Basis of design is East Jordan Iron Works (EJ) Models 1322, 3027, or equal.

Manhole covers at Storm Sewers to include cast letters “STORM”.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

D. Handle catch basins and stormwater inlets according to manufacturer's written rigging instructions.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Owner’s Representative no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Owner's written permission.

PART 2 - PRODUCTS

2.1 MANHOLES

A. Standard Precast Concrete Manholes shall appear on the NYSDOT Approved List of Precast Concrete Manufacturers for QA/QC Production (Group 2, Drainage Units):

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
4. Joint Sealant: ASTM C 990, bitumen or butyl rubber.

5. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.
6. At the option of the Contractor, precast reinforced concrete manhole sections may be constructed on poured-in-place concrete slab foundations with thickness and reinforcing equal to or exceeding that as designated in ASTM C478. Design drawings and calculations regarding poured-in-place manhole foundations shall be submitted to the Owner's Representative.
7. Precast concrete manhole sections shall fit together readily and unless specifically noted, the connections shall be jointed with self-contained "0" ring gaskets. The inside and outside of the joint shall be grouted with an approved non-shrink grout.
8. Top sections shall have a surface suitable to receive concrete brick masonry or precast adjusting rings.

B. Brick Manholes and Storm Water Structures:

1. Masonry for manholes and storm water structures shall include all manhole and inlet structures of common brick and cement mortar, brick courses for vaults or concrete or precast concrete manholes where required to bring the frames and covers to grade and the building in of metal castings, pipes, sleeves and other items required in the work complete as shown, specified and directed. All common brick shall be ASTM Des:C62, Grade SW. There shall be at least two brick courses provided for all concrete or precast concrete pipe manholes and vaults.
2. Mortars shall be mixed in the proportions that follow:
   a. 1 sack of masonry cement (94 pounds)
   b. 3 cubic feet of dry sand (240 pounds)
3. Masonry cement shall be Brixment, Huron, Alpha or equal, ASTM Des: C91, Type II.
4. Sand shall be of graded quality conforming to the requirements of ASTM Des:C144. Water shall be clean, potable water, free from injurious or deleterious materials.
5. All bricks shall be of the best quality, hard burned brick, shall be whole, sound, straight, hard, uniform in structure with true faces and shall be of standard size.
6. Bricks shall be sampled and tested for absorption in accordance with ASTM Des: C67. Absorption shall not exceed 9 percent. Tests shall be at an independent testing laboratory and all tests shall be at the expense of the Contractor. Certified test reports shall be furnished to the Owner's Representative.

7. The bricks shall be culled and sorted when delivered upon the ground by experienced men furnished by the Contractor and all bricks condemned shall be immediately removed from the site of the work.
8. The bricks shall be laid in mortar of a kind and quality specified above. They shall be laid with a shove joint and all spaces between bricks shall be solidly and completely filled with mortar. The bricks shall be laid to a line with the bed in the line of the radii of the curves and with close joints not exceeding 1/4-inch. Bricks shall be thoroughly moistened before laying. Each brick shall be completely bedded in mortar at its bottom side and end at one operation. Joints on face work shall be struck and neatly pointed. Care shall be taken to have the interior surface smooth and regular. Competent masons shall be employed for this work.
9. No masonry shall be erected when the temperature has dropped below 45 degrees F, unless it is rising and at no time when it has dropped below 40 degrees F except by permission of the Owner's Representative. When masonry work is permitted below 40 degrees F, provisions shall be made for heating and drying the materials and the completed work shall be protected in accordance with the Structural Clay Products Technical Institute Notes, Volume I, No. 1. Masonry shall not be laid with ice or frost on its surface and no masonry shall be laid on frozen work. Any work which freezes before the mortar has set shall be removed and replaced at the Contractor's own expense.
10. Unfinished work shall be stepped back for jointing new work and no toothing shall be permitted unless specifically approved. Before new work is started, loose mortar shall be removed to expose the joint and shall be thoroughly wetted 12 hours before laying the new work.
11. The inside and outside face of the brick work of each manhole shall be neatly plastered with mortar not less than 3/8-inch thick, of the quality above-specified and trowelled smooth.
12. The Contractor shall provide all necessary forms and centers required for laying brick masonry. They shall be true to the required curves, shapes, and sizes, strong enough to withstand all operations incidental to the placing of the brick work and the face against which the work is to be laid shall be satisfactorily smooth and clean.
13. Directions as to the time of removing forms and centers shall be strictly followed and the removing shall be done with great care so as to avoid injury to the work.
14. All fresh work shall be protected from injury of all kinds and any injured work shall be made good by the Contractor in a manner satisfactory to the Owner's Representative. All new work, unless immediately covered with earth, shall be kept moist until the mortar has become hard and will not crack in the sun.

C. Manhole Frames, Grates and Covers:

1. Manhole frames and covers, grates, inlets, steps and other castings shall be in accordance with the NYSDOT Approved List of Precast Concrete Manufacturers for QA/QC Production (Group 2, Drainage Units). Where required, manhole covers shall have the word "Storm Sewer", "Sanitary Sewer" or other appropriate designation cast as shown on the Contract Drawings. Sizes and types of frames, grates, and covers are identified on the Project Plans,
2. All castings for manhole frames and covers shall each have machined bearing surfaces.

2.2 DAMPPROOFING

A. Manholes shall have dampproofing. The dampproofing shall be Hydrocide 648 by Sonneborn Building Products; Dehydratine 4 by A.C. Horn Inc.; Meadows Trowel Mastic (Type 3) or equal.

2.3 CONCRETE

A. Refer to Division 03 Section “Cast-in-Place Concrete” for information regarding concrete properties, mixes, placement, and curing.

2.4 CATCH BASINS

A. Shall meet the requirements for the sizes shown on the project plans.

2.5 DRAINAGE STRUCTURE COVERS AND GRATES

A. Shall be of good quality, designed for H-20 traffic loading. Manufactured by East Jordan Iron Works, as specified on the project plans, or approved equal. Catch Basin Grates that are installed in walkway areas shall be ADA approved, with heel-proof openings.

PART 3 - EXECUTION

3.1 PRECAST MANHOLE AND CATCHBASIN INSTALLATION

A. Excavation and Backfill:
   1. Excavate for manholes and drainage structures in accordance with Division 31 Section "Earth Moving” in location and to depth shown. Provide clearance around sidewalls of structure for construction operations.
   2. If groundwater is encountered, prevent accumulation of water in excavations in accordance with Division 31 Section "Dewatering”. Place drainage structures in dry trench.
   3. Where possibility exists of watertight structure becoming buoyant in flooded excavation, anchor structure to avoid flotation.
   4. Backfill excavations for manholes and drainage structures in accordance with Division 31 Section "Earth Moving.”

B. Install manholes and drainage structures supported at proper grade and as shown on Drawings.

C. Form and place manhole and drainage structures cylinder plumb and level, to correct dimensions and elevations. As Work progresses, install cast frames for fabricated grates (drainage structures) and covers (manholes).

D. Cut and fit for pipe.

E. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as indicated on Drawings.

F. Lift precast components at lifting points designated by manufacturer.

G. When lowering manholes and drainage structures into excavations and joining pipe to units, take precautions to ensure interior of pipeline and structure remains clean.

H. Set precast structures bearing firmly and fully on crushed stone bedding (Type A1 subbase), compacted in accordance with provisions of Division 32 Section "Aggregate for Earthwork" (Section 310516) or on other support system shown on Drawings.

I. Assemble multi-section structures by lowering each section into excavation. Lower, set level, and firmly position base section before placing additional sections.

J. Remove foreign materials from joint surfaces and verify sealing materials are placed properly. Maintain alignment between sections by using guide devices affixed to lower section.

K. Joint sealing materials may be installed on site or at manufacturer's plant.

L. Verify manholes and drainage structures installed satisfy required alignment and grade.

M. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe. Fill annular space with mortar.

N. Shape inverts through manhole and drainage structures as shown on Drawings. Install sumps as shown on the drawings.

O. Dampproofing: Outer surfaces of precast and cast-in-place manholes and structures below finished grade shall be given two coats of bituminous dampproofing at the rate of 30 to 60 sq ft per gallon as directed by the Owner's Representative and in accordance with manufacturer's instructions.

P. Refer to Division 33 Section "Sewer Bypass Pumping" for bypass requirements during manhole installation.

3.2 FRAME AND COVER INSTALLATION

A. Set cover frames and covers level without tipping, to correct elevations, using mortar and masonry. Install radially laid concrete brick with 1/4 inch thick vertical joints at inside perimeter. Lay concrete brick in full bed of mortar and completely fill joints. Where more than one course of concrete brick is required, stagger vertical joints.

B. All structures shall be constructed as shown on the applicable detail sheets of the Contract Drawings, including formed bench walls and troughs, steps where specified, base, walls and top sections either concentric cone, eccentric cone or flat slab, adjusting rings of brick or precast sections and frames and covers and/or inlet grates as specified.

C. The Contractor shall, at his own cost and expense, reset any and all manhole frames and covers and/or inlet grates as required to meet the finish grade of pavements replaced by the Contractor as specified herein.

D. Frames and covers shall be thoroughly cleaned. Where the shop coating has become damaged it shall be spot coated with Bitumastic. The frame shall be set in a full bed of mortar. If masonry courses are required to bring the frame to grade, the top course shall have a flat, level surface to receive the frame.

E. Set cover frames and covers level without tipping, to correct elevations.

3.3 FIELD QUALITY CONTROL

A. Inspect interior of structure to determine any damage that needs to be repaired and for leakage. Inspect after approximately backfill is in place, and again at completion of Project. Reinspect and repeat procedure until results are satisfactory.

3.4 LEAKAGE TESTS

A. Leakage tests shall be made and observed by the Owner's Representative on each manhole or structure. The test shall be the exfiltration test made as described in this Specification.

B. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorptions, etc, i.e. it will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete. Furthermore, take any steps necessary to assure the Owner's Representative that the water table is below the bottom of the manhole throughout the test.

C. If the groundwater table is above the highest joint in the manhole, and if there is no leakage into the manhole as determined by the Owner's Representative, such a test can be used to evaluate the water- tightness of the manhole. However, if the Owner's Representative is not satisfied, lower the water table and carry out the test as described herein.

D. Leakage Tests for Structures: The Owner's Representative will visually inspect structure(s) for possible leaks before backfilling of structures is allowed. All joints shall be sealed to the satisfaction of the Owner's Representative. The Owner's Representative may require an exfiltration test as described for manholes on any structure for which he/she deems the test appropriate.

E. The equivalent leakage allowance shall be 4.5 gallons per manhole per 24 hours for 48-inch diameter manholes, and shall be 5.7 gallons per manhole per 24 hours for 60-inch and above diameter manholes.

3.5 CLEANING

A. All new manholes shall be thoroughly cleaned of all silt, debris and foreign matter of any kind, prior to final inspection.

3.6 FIELD QUALITY CONTROL

Inspect interior of structure to determine any damage that needs to be repaired and for leakage. Inspect after approximately backfill is in place, and again at completion of Project. Reinspect and repeat procedure until results are satisfactory.

END OF SECTION 334413

SECTION 334438 – ADJUSTING ELEVATIONS OF MANHOLES AND DRAINAGE STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Raising or lowering manhole frames and covers.
   2. Resetting manhole frames and covers.

B. Related Sections:
   1. Division 33 Section “Storm Utility Drainage Piping.”
   2. Division 33 Section “Precast Concrete Manholes and Structures”
   3. Division 33 Section “Manhole Rehabilitation”

1.2 SUBMITTALS

A. Product Data: Submit manhole riser rings construction, features, configuration, type of concrete mix, and brick to be used (if applicable).

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with the New York State Department of Transportation (NYSDOT) January 1, 2026 Standard Specifications:
   1. Section 604: Drainage Structures.
   2. Section 604-3.08: Altering Drainage Structures, Leaching Basins, and Manholes.

B. Preinstallation Conference: Conduct conference at Project Site.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with a minimum of three years’ experience.

1.5 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

B. Prior to adjustment, Contractor to verify proposed Rim Elevation of structure.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Brick: ASTM C32, Grade MS solid.

B. Accessories:
   1. Joint Sealant: ASTM C990.
   2. Bolts: Stainless steel ASTM F593; galvanized ASTM F1554.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify and locate manholes requiring grade adjustment.

3.2 EXISTING WORK

A. Saw cut existing paving (if necessary).

B. Excavate.

C. Clean manholes.

D. Remove existing manhole frames and covers.

E. Repair waterproofing.

3.3 RAISING MANHOLE FRAMES AND COVERS

A. Perform Work in accordance with NYSDOT January 1, 2026 Standard Specifications, Section 604-3.08 - Altering Drainage Structures, Leaching Basins, and Manholes

B. Locate and raise manholes to grade as indicated on Drawings.

C. Use flat or tapered rubber manhole rings to achieve elevation indicated for frame and cover. Precast rings are preferred instead of brick to adjust / raise rim elevations. If brick is utilized, use no more than 4 courses.

D. Seal joints between manhole top, rubber rings, and frame with sealant. Purge masonry inside and out.

E. Reinstall removed manhole frame and cover (unless a new frame and cover is specified on the Project Plans).

3.4 PAVING RESTORATION

A. Restore bituminous paving areas in accordance with Division 32 Section “Flexible Paving.”

3.5 LANDSCAPING RESTORATION

A. Restore grassed areas in accordance with Division 32 Section “Turf and Grasses.”

END OF SECTION 334438

SECTION 340133 - MAINTENANCE AND PROTECTION OF TRAFFIC

PART 1 GENERAL

1.1 SUMMARY

Maintenance and Protection of Traffic shall consist of all work necessary to provide for the safe and efficient movement of traffic through or around work zones, and to protect workers, area vehicle operators, and pedestrians from damage to person and property which may result, directly or indirectly, from any construction operations. Maintenance and Protection of Traffic shall be completed under the direction of a trained, competent person, as shown in the contract documents, the MUTCD.

Maintenance and Protection of Traffic is required at all work zones where vehicle operators and pedestrians are within 75 ft of the work area. This includes but is not limited to construction areas within the SUNY Alfred College Campus.

The duration of this work shall be from the date any work is started on the contract site, including mobilization of equipment, signs, and offices, until the date of contract final acceptance. Temporary materials and components that are furnished by the Contractor shall remain the property of the Contractor.

1.2 REFERENCES

A. Village of Alfred: Permit and Requirements for working in the Village right-of-way (not anticipated).

B. New York State Department of Transportation (NYSDOT):
1. Standard Specifications, January 1, 2026 – Section 619 (Work Zone Traffic Control).
2. Standard Sheets, 619-10, 619-11, 619-20, and 619-60.

C. The 2009 Federal Manual of Uniform Traffic Control Devices (MUTCD) and the New York State Supplement.

1.3 SUBMITTALS

A. Shop Drawings: Indicate layout, of Work Zone Setups along roadways, security entrances, and parking lot intersections. Show coordination with Plant traffic and construction traffic for new building construction areas.

B. Prior to performing any work within the lanes of Upper College Drive, the Contractor shall obtain confirmation from the Owner’s Representative.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with NYSDOT January 1, 2026 Standard Specifications, Section 619.

B. Use traffic control delineation devices meet the material requirements of NYSDOT Section 619.

C. The Contractor shall designate a work zone traffic control competent person who has the primary responsibility and sufficient authority for implementing the work zone traffic control plan and other safety and mobility aspects as necessary. The Contractor's work zone traffic control competent person shall be appropriately experienced and adequately trained in traffic control operations by recognized training programs, including the American Traffic Safety Services Association (ATSSA), the National Safety Council, unions, or construction industry associations, or by an individual instructor from such a program in accordance with the level of decisions that the individual will be required to make, reflecting current industry practices.

PART 2 PRODUCTS

2.1 MATERIALS

A. Furnish materials in accordance with NYSDOT, Section 619 of the January 1, 2026 NYSDOT Standard Specifications. This includes construction barricades (Type II and Type III), temporary concrete barrier, road cones, warning lights, and construction barrels (drums).

PART 3 EXECUTION

3.1 BASIC WORK ZONE TRAFFIC CONTROL

Work shall consist of controlling vehicle, bicycle, and pedestrian traffic over a reasonably smooth traveled way which shall be marked by signs, delineators, channelizing devices, pavement markings, and other devices as shown in the contract documents or as directed by the Owners Representative. Work after sunset and before sunrise shall include additional requirements for nighttime operations including, but not limited to, a written plan for nighttime operations, additional worker and equipment protection, additional channelizing devices and contract site patrol. The Contractor shall conduct its operations to ensure the safety and convenience of travelers as well as the safety of all workers on the contract.

Travelers include, but may not be limited to motorists (cars, heavy trucks, tractor trailers), and pedestrians. Work shall be scheduled to keep the time and distance that existing pavement is removed or substantially disturbed to a minimum and consistent with the physical requirements of the contract.

Unless otherwise indicated in the contract documents, the distance over which traffic is maintained on an unpaved surface shall not exceed 1/2 mile at any one time. During seasonal shutdown periods, no part of the roadway shall be closed to traffic unless provided for in the contract documents.

Basic work zone traffic control shall include the following:

- Maintaining the surface condition of the traveled way so that it is free of debris and dust, maintaining positive drainage.
- Maintaining the traveled way to facilitate safe, efficient travel and permit snow and ice control by others during winter months and during any period that work is suspended.
- Maintain existing road signs, markers, and temporary construction fencing.
- Installing, moving, and maintaining construction signs.
- Providing Flaggers as needed when necessary to provide adequate traffic control.
- Providing and installing pavement patching materials as needed to keep the pavement maintained for traffic.
- Installing road plates as necessary when excavations next to traffic need to be left open at the end of a workday.

3.2 MAINTAINING TRAVELED WAY

The Contractor shall generally maintain a traveled way suitable for moving traffic, in accordance with the contract documents and ensure construction equipment, vehicles, and materials are safely stored during non-working hours so as not to constitute a hazard to vehicles and pedestrians. Construction operations shall be conducted to ensure a minimum of delay to traffic. Stopping traffic for more than 5 minutes shall not be permitted unless specifically authorized in the contract documents or in writing by the Owner's Representative. All operations shall be carried out in a manner that provides workers with safe access to the worksite and protects workers from moving traffic. The work zone traffic control competent person shall routinely inspect all work zone traffic control equipment and devices.

3.3 PAVEMENT EDGE DROP-OFF PROTECTION

A drop-off is an abrupt difference in surface elevation of more than 2 inches at approximately 1V:3H or steeper.

The Contractor shall provide pavement edge drop-off protection in accordance with Drums (Barrels) spaced at 40 ft, or other approved channelizing devices. Channelizing devices used to mark drop-offs shall be placed, as practicable, to not reduce the available travel lane width, at the elevation of the open travel lane in order to provide maximum target value and visibility for motorists. A drop-off of greater than 24 inches within 10 feet from the edge of the traveled way that is 100 feet or less in length will be allowed with channelizing devices consisting of drums, extra tall cones or oversized vertical panels only at a maximum spacing of 20 feet for short

durations not to exceed one work shift. Unless otherwise noted in the contract documents, the Contractor shall begin work to eliminate unprotected drop-offs created by contract work within 7 calendar days of the completion of the work creating the drop-off. Work shall continue in a timely manner until such time as the unprotected drop-off condition is eliminated.

3.4 WORK ZONE ACCOMODATIONS FOR PEDESTRIANS (refer to Project Plans)

A. Pedestrians shall not be led into direct conflicts with work site vehicles, equipment, or operations.

B. Pedestrians should not be led into direct conflicts with mainline traffic moving around the work site.

C. Pedestrians shall be provided with an accessible path that is clearly delineated for both pedestrians and nearby traffic.

3.5 PLACEMENT OF TYPE III CONSTRUCTION BARRICADES

Type III construction barricades shall be installed at all locations where a segment of the roadway or sidewalk is closed to traffic. Type III construction barricades shall be maintained upright, in proper alignment and orientation. If ballast is used to maintain alignment and position of the barricade, it shall consist of dry sand contained in a closed waterproof bag, and shall be placed at ground level. Barricade rails shall be oriented such that the stripes slope downward toward the side on which traffic is to pass. If traffic may pass to either side, adjacent barricades shall be arranged such that the stripes slope downward toward each side starting at the center. Where no passage is intended or permitted, the stripes shall slope downward toward the center of the barricade or barricades.

At night, each Type III construction barricade used to close a roadway, a segment of a roadway or a sidewalk shall be equipped with one flashing warning light.

END OF SECTION 340133

SECTION 344113 - TRAFFIC SIGNS

PART 1 GENERAL

1.01 SUBMITTALS

A. Shop Drawings: Show shop drawings, not necessarily to scale, but sufficient enough in detail to show color, wording, lettering size and style, overall sign size, construction details and installation details for each type of sign.

PART 2 PRODUCTS

2.01 TRAFFIC SIGNS

A. Construction Materials: Comply with the applicable requirements of the New York State Department of Transportation (NYS DOT) Standard Specifications Section 645.

B. Posts: Galvanized steel. Provide NYSDOT Type “A” sign posts, as per NYSDOT 645 (nominal 2”x2” galvanized steel).

C. Provide signs that meet the National Manual of Uniform Traffic Control Devices (NMUTCD) requirements, per the NMUTCD designations that are provided on the Project Drawings.

D. Temporary Signs that are used to provide wayfinding during the various phases of construction are to utilize 8” letters on a reflective background. Plywood substrate may be used with reflective sheeting for the temporary signs. If any temporary signs become damaged, severely worn, or dilapidated, they shall be replaced by the Contractor.

PART 3 EXECUTION

3.01 INSTALLATION

A. Erect signs in their designated locations, as indicated and in accordance with the approved shop drawings and the applicable requirements of NYS DOT Section 645-3, and NYS DOT 645 Series Standard Sheets.

B. Protect surfaces and finishes from abrasion and other damage during handling and installation.

C. Replace damaged or faulty signs.

D. At existing signs to be relocated: Relocate using new Type A galvanized post. If existing post is salvageable, and in good condition, it can be reset, as confirmed with the Owner’s Representative

END OF SECTION