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# JOHNSON CITY CENTRAL SCHOOL DISTRICT

**Johnson City, New York**

# CAPITAL PROJECT 2025 2026 PHASE 2

HIGH SCHOOL..... SED # 03-15-02-06-0-011-027
K-8 ELEMENTARY MIDDLE..... SED # 03-15-02-06-0-020-017
BUS GARAGE..... SED # 03-15-02-06-5-010-011
BUS STORAGE SOUTH..... SED # 03-15-02-06-4-014-006
BUS STORAGE NORTH..... SED # 03-15-02-06-4-015-006

HA PN: 2024-239P

# VOLUME 2 CIVIL SPECIFICATION

"The design of this project conforms to all applicable provisions of the New York State Uniform Fire Prevention and Building Code, the New York State Energy Conservation Code, and the building standards of the New York State Education Department."

**December 1, 2025**

**JOHNSON CITY CENTRAL SCHOOL DISTRICT**
**CAPITAL PROJECT 2025 & 2026 - PHASE 2**
**ISSUED FOR BIDDING**
**DECEMBER 1, 2025**

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**HA PN: 2024-239P**

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SECTION 03 10 00

CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Formwork for cast-in-place concrete.
2. Shoring, bracing, and anchorage.
3. Form accessories.
4. Form stripping.

B. Related Requirements:

1. Section 03 20 00 - Concrete Reinforcing: Reinforcing steel and required supports for cast-in-place concrete.
2. Section 03 30 00 - Cast-in-Place Concrete: Cast-in-place or in-situ concrete for structural building frame, slabs-on-grade, and other concrete components associated with building.

1.2 REFERENCE STANDARDS

A. American Concrete Institute:

1. ACI 117 - Specification for Tolerances for Concrete Construction and Materials.
2. ACI 301 - Specifications for Structural Concrete.
3. ACI 318 - Building Code Requirements for Structural Concrete.
4. ACI 347 - Guide to Formwork for Concrete.

B. American Forest & Paper Association:

1. AF&PA - National Design Specification (NDS) for Wood Construction.

C. APA - The Engineered Wood Association:

1. APA/EWA PS 1 - Voluntary Product Standard - Structural Plywood.

D. ASTM International:

1. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
2. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.

1.3 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Coordinate Work of this Section with other Sections of Work in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer information on void form materials and installation requirements.

C. Shop Drawings:

1. Indicate:

a. Formwork, shoring, and reshoring.
b. Pertinent dimensions, openings, methods of construction, types of connections, materials, joint arrangement and details, ties and shores, location of framing, studding and bracing, and temporary supports.
c. Means of leakage prevention for concrete exposed to view in finished construction.
d. Sequence and timing of erection and stripping, assumed compressive strength at time of stripping, height of lift, and height of drop during placement.
e. Vertical, horizontal, and special loads according to ACI 347, and camber diagrams when applicable.
f. Notes to formwork erector showing size and location of conduits and piping embedded in concrete according to ACI 318.
g. Procedure and schedule for removal of shores and installation and removal of reshores.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

F. Qualifications Statement:

1. Submit qualifications for licensed professional.

1.5 QUALITY ASSURANCE

A. Perform Work according to ACI 347, and 318.

B. For wood products furnished for Work of this Section, comply with AF&PA.

C. Perform Work according to New York state standards.

D. Maintain one copy of each standard affecting Work of this Section on Site.

1.6 QUALIFICATIONS

A. Licensed Professional: Professional engineer experienced in design of specified Work and licensed at Project location in State of New York.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept void forms on Site in manufacturer's original packaging and inspect for damage.

C. Store materials off ground in ventilated and protected manner to prevent deterioration from moisture.

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN CRITERIA

A. Design, engineer, and construct formwork, shoring, and bracing according to ACI 318 to conform to design and applicable code requirements to achieve concrete shape, line, and dimension as indicated on Drawings.

B. Vapor Retarder Permeance: Maximum 1 perm when tested according to ASTM E96, desiccant or water method.

2.2 WOOD FORM MATERIALS

A. Form Materials: At discretion of Contractor.

B. Lumber Forms:

1. Applications: Edge forms and unexposed finish concrete.
2. Boards:

a. Description:

1) Shiplapped or tongue and groove.
2) Surface boards on four sides.

b. Material: "Standard" grade Douglas fir according to WCLIB Standard No. 17.
c. Width: 6 or 8 inches.

C. Plywood Forms:

1. Application: Exposed finish concrete.
2. Description:

a. Comply with APA/EWA PS 1.
b. Panels: Full size, 4 by 8 feet.
c. Label each panel with grade trademark of APA/EWA.

3. Plywood for Surfaces to Receive Membrane Waterproofing:

a. Minimum Thickness: 5/8 inch.
b. Grade: APA/EWA "B-B Plyform Structural I Exterior."

4. Plywood with "Smooth Finish" Indicated on Drawings:

a. Minimum Thickness: 3/4 inch.
b. Grade: APA/EWA "HD Overlay Plyform Structural I Exterior."

## 2.3 PREFABRICATED FORMS

A. Furnish materials according to New York state standards.

B. Preformed Steel Forms:

1. Description: Matched, tightly fitted, and stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
2. Minimum Thickness: 16 gage.

C. Steel Forms:

1. Description: Sheet steel, suitably reinforced.
2. Design: For particular use as indicated on Drawings.

D. Form Liners: Smooth, durable, grainless, and non-staining hardboard unless otherwise indicated on Drawings.

E. Framing, Studding, and Bracing: Stud or No. 3 structural light-framing grade.

## 2.4 FORMWORK ACCESSORIES

A. Form Ties:

1. Type: Snap off; cone.
2. Material: Galvanized.
3. Length: Fixed.
4. Furnish waterproofing washer.
5. Free of defects capable of leaving holes larger than 1-1/2 inch in concrete surface.

B. Form Release Agent:

1. Description: Colorless mineral oil that will not stain concrete or absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete.

C. Corners:

1. Type: Chamfer, wood strip.
2. Size: 3/4 by 3/4 inches.
3. Lengths: Maximum possible.

D. Vapor Retarder:

1. Description: Polyethylene sheet.
2. Thickness: 8 mils.

E. Bituminous Joint Filler: Comply with ASTM D1751.

F. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size, strength, and character to maintain formwork in place while placing concrete.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify lines, levels, and centers before proceeding with formwork.

C. Verify that dimensions agree with Drawings.

D. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement, request instructions from Architect/Engineer before proceeding.

### 3.2 INSTALLATION

A. Earth Forms: Not permitted.

B. Formwork:

1. Provide top form for sloped surfaces steeper than 1.5 horizontal to 1 vertical to hold shape of concrete during placement, unless it can be demonstrated that top forms can be omitted.
2. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.
3. Camber forms where necessary to produce level finished soffits unless indicated otherwise on Drawings.
4. Positioning:

a. Carefully verify horizontal and vertical positions of forms.
b. Correct misaligned or misplaced forms before placing concrete.

5. Complete wedging and bracing before placing concrete.
6. Erect formwork, shoring, and bracing to achieve design requirements according to ACI 301 and 318.
7. Stripping:

    a. Arrange and assemble formwork to permit dismantling and stripping.
    b. Do not damage concrete during stripping.
    c. Permit removal of remaining principal shores.

8. Obtain approval of Architect/Engineer before framing openings in structural members not indicated on Drawings.
9. Install fillet and chamfer strips on external corners as needed.
10. Install void forms according to manufacturer instructions.
11. Do not reuse wood formwork more than one time for concrete surfaces to be exposed to view.
12. Do not patch formwork.
13. Leave forms in place for minimum number of days according to ACI 347.

C. Form Removal:

1. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads, and removal has been approved by Architect/Engineer.
2. Loosen forms carefully; do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
3. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged.
4. Discard damaged forms.
5. Form Release Agent:

    a. Apply according to manufacturer instructions.
    b. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
    c. Do not apply form release agent if concrete surfaces are indicated to receive special finishes or applied coverings that may be affected by agent.
    d. Soak inside surfaces of untreated forms with clean water, and keep surfaces coated prior to placement of concrete.

6. Form Cleaning:

    a. Clean forms as erection proceeds to remove foreign matter within forms.
    b. Clean formed cavities of debris prior to placing concrete.
    c. Flush with water or use compressed air to remove remaining foreign matter.
    d. Ensure that water and debris drain to exterior through cleanout ports.
    e. Cold Weather:

        1) During cold weather, remove ice and snow from within forms.
        2) Do not use de-icing salts.
        3) Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure; use compressed air or other dry method to remove foreign matter.

7. Reuse and Coating of Forms:

    a. Thoroughly clean forms and reapply form coating before each reuse.
    b. For exposed Work, do not reuse forms with damaged faces or edges.
    c. Apply form coating to forms according to manufacturer instructions.
    d. Do not coat forms for concrete indicated to receive "scored finish."
    e. Apply form coatings before placing reinforcing steel.

D. Forms for Smooth Finish Concrete:

1. Use steel, plywood, or lined-board forms.
2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.
3. Install form lining with close-fitting square joints between separate sheets without springing into place.
4. Use full-sized sheets of form liners and plywood wherever possible.
5. Tape joints to prevent protrusions in concrete.
6. Apply forming and strip wood forms in a manner to protect corners and edges.
7. Level and continue horizontal joints.
8. Keep wood forms wet until stripped.

E. Forms for Surfaces to Receive Membrane Waterproofing:

1. Use plywood or steel forms.
2. After erection of forms, tape form joints to prevent protrusions in concrete.

F. Framing, Studding, and Bracing:

1. Maximum Spacing of Studs:

    a. Boards: Maximum 16 inches o.c.
    b. Plywood: 12 inches o.c.

2. Size framing, bracing, centering, and supporting members for sufficient strength to maintain shape and position under imposed loads from construction operations.
3. Construct beam soffits of material minimum 2 inches thick.
4. Distribute bracing loads over base area on which bracing is erected.
5. When placed on ground, protect against undermining, settlement, and accidental impact.

G. Form Anchors and Hangers:

1. Do not use anchors and hangers leaving exposed metal at concrete surface.
2. Symmetrically arrange hangers supporting forms from structural-steel members to minimize twisting or rotation of member.
3. Penetration of structural-steel members is not permitted.

H. Inserts, Embedded Parts, and Openings:

1. Install formed openings for items to be embedded in or passing through concrete Work.
2. Locate and set in place items required to be cast directly into concrete.
3. Install accessories straight, level, and plumb, and ensure that items are not disturbed during concrete placement.

4. Openings:

    a. Provide temporary ports or openings in formwork as required to facilitate cleaning and inspection.
    b. Locate openings at bottom of forms to allow flushing water to drain.

5. Close temporary openings with tight-fitting panels, flush with inside face of forms, and neatly fitted such that joints will not be apparent in exposed concrete surfaces.

I. Form Ties:

1. Provide sufficient strength and quantity to prevent spreading of forms.
2. Place ties at least 1 inch away from finished surface of concrete.
3. Leave inner rods in concrete when forms are stripped.
4. Space form ties equidistant, symmetrical, and aligned vertically and horizontally unless indicated otherwise on Drawings.

J. Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.

K. Construction Joints:

1. Install surfaced pouring strip where construction joints intersect on exposed surfaces to provide straight line at joints.
2. Just prior to subsequent concrete placement, remove strip and tighten forms to conceal shrinkage.
3. Appearance:

    a. Show no overlapping of construction joints.
    b. Construct joints to present same appearance as butted plywood joints.

4. Arrange joints in continuous line straight, true, and sharp.

L. Embedded Items:

1. Make provisions for pipes, sleeves, anchors, inserts, reglets, anchor slots, nailers, waterstops, and other features.
2. Do not embed wood or uncoated aluminum in concrete.
3. Obtain installation and setting information for embedded items furnished under other Sections.
4. Securely anchor embedded items in correct location and alignment prior to placing concrete.
5. Ensure that conduits and pipes, including those made of coated aluminum, meet requirements of ACI 318 regarding size and location limitations.

M. Openings for Items Passing through Concrete:

1. Frame openings in concrete where indicated on Drawings.
2. Establish exact locations, sizes, and other conditions required for openings and attachment of Work specified under other Sections.
3. Coordinate Work to avoid cutting and patching of concrete after placement.
4. Perform cutting and repairing of concrete required as result of failure to provide required openings.

N. Screeds:

1. Set screeds and establish levels for tops of and finish on concrete slabs.
2. Slope slabs to drain where required or as indicated on Drawings.
3. Before depositing concrete, remove debris from space to be occupied by concrete and thoroughly wet forms; remove freestanding water.

O. Screed Supports:

1. For concrete over waterproof membranes and vapor retarder membranes, use cradle-, pad-, or base-type screed supports that will not puncture membrane.
2. Staking through membrane is not permitted.

## 3.3 TOLERANCES

A. Construct formwork to maintain tolerances according to ACI 318.

## 3.4 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Inspection:

1. Inspect erected formwork, shoring, and bracing to ensure that Work complies with formwork design and that supports, fastenings, wedges, ties, and items are secure.
2. Notify Architect/Engineer after placement of reinforcing steel in forms but prior to placing concrete.
3. Schedule concrete placement to permit formwork inspection before placing concrete.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Reinforcing bars.
2. Welded wire fabric.
3. Reinforcement accessories.

B. Related Requirements:

1. Section 03 10 00 - Concrete Forming and Accessories: Form materials, waterstops, and accessories required to form cast-in-place concrete.
2. Section 03 30 00 - Cast-in-Place Concrete: Cast-in-place or in-situ concrete for structural building frame, slabs on grade, and other concrete components associated with building.

1.02 REFERENCE STANDARDS

A. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete.
2. ACI 318 - Building Code Requirements for Structural Concrete.
3. ACI 530/530.1 - Building Code Requirements and Specification for Masonry Structures.
4. ACI SP-66 - ACI Detailing Manual.

B. American Welding Society:

1. AWS D1.4 - Structural Welding Code - Reinforcing Steel.

C. ASTM International:

1. ASTM A184 - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement.

2. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

3. ASTM A704 - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.

4. ASTM A706 - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.

D. Concrete Reinforcing Steel Institute:

1. CRSI 10-MSP - Manual of Standard Practice.
2. CRSI 10PLACE - Placing Reinforcing Bars.

1.03 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Coordinate Work of this Section with placement of formwork, formed openings, and other Work.

1.04 PREINSTALLATION MEETINGS

A. Section 01 30 00 - Administrative Requirements: Requirements for preinstallation meeting.

1.05 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings:

1. Indicate bar sizes, spacings, locations, splice locations, and quantities of reinforcing steel and welded wire fabric.
2. Indicate bending and cutting schedules.
3. Indicate supporting and spacing devices.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Submit certified copies of mill test report of reinforcement materials analysis.

E. Welder Certificates: Certify welders and welding procedures employed on Work, verifying AWS qualification within previous 12 months.

F. Source Quality-Control Submittals: Indicate results of factory tests and inspections.

G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

H. Qualifications Statement:

1. Welders: Qualify procedures and personnel according to AWS D1.1.

1.06 QUALITY ASSURANCE

A. Perform Work according to ACI 318.

B. Prepare Shop Drawings according to ACI SP-66.

C. Perform Work according to New York state standards.

D. Maintain one copy of each standard affecting Work of this Section on Site.

1.07 QUALIFICATIONS

A. Welders: AWS qualified within previous 12 months for employed weld types.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store materials according to manufacturer instructions.

D. Protection:

1. Protect materials from moisture by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.09 EXISTING CONDITIONS

A. Field Measurements:

1. Verify field measurements prior to fabrication.
2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel:

1. Comply with ASTM A615.
2. Yield Strength: 60 ksi.

3. Billet Bars: Deformed.
4. Finish: Uncoated.

B. Welded Plain Wire Fabric:
1. Comply with ASTM A1064.
2. Configuration: Flat sheets.
3. Finish: Uncoated.

2.02 FABRICATION

A. Fabricate concrete reinforcement according to ACI 318.

B. Form standard hooks for as indicated on Drawings.

C. Form reinforcement bends with minimum diameters according to ACI 318.

D. Fabricate column reinforcement with offset bends at reinforcement splices.

E. Form ties and stirrups from following:

1. Bars No. 10 and Smaller: No. 3 deformed bars.
2. Bars No. 11 and Larger: No. 4 deformed bars.

F. Weld reinforcement according to AWS D1.4.

G. Splicing:

1. If not indicated on Drawings, locate reinforcement splices at point of minimum stress.
2. Obtain approval of splice locations from Engineer.

2.03 ACCESSORY MATERIALS

A. Tie Wire:

1. Minimum 16 gage, annealed type.

B. Chairs, Bolsters, Bar Supports, and Spacers:

1. Size and Shape: To strengthen and support reinforcement during concrete placement conditions.
2. Furnish load-bearing pad on bottom to prevent vapor retarder puncture.

2.04 SOURCE QUALITY CONTROL

A. Provide shop inspection and testing of completed assembly.

B. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

C. Certificate of Compliance:

1. If fabricator is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.
2. Specified shop tests are not required for Work performed by approved fabricator.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Place, support, and secure reinforcement against displacement.

B. Do not deviate from required position beyond specified tolerance.

C. Do not weld crossing reinforcement bars for assembly except as permitted by Engineer.

D. Do not displace or damage vapor retarder.

E. Accommodate placement of formed openings.

F. Spacing:
1. Space reinforcement bars with minimum clear spacing according to ACI 318.
2. If bars are indicated in multiple layers, place upper bars directly above lower bars.

G. Maintain minimum concrete cover around reinforcement according to ACI 318 as follows:

H. Splice reinforcing where indicated on Drawings and according to manufacturer's instructions.

3.02 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.
B. Foundation Walls: Install reinforcement within tolerances according to ACI 530/530.1.

3.03 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Field inspection and testing will be performed by Owner's testing laboratory according to ACI 318 and New York state code.

C. Provide unrestricted access to Work and cooperate with appointed inspection and testing firm.

D. Reinforcement Inspection:

1. Placement Acceptance: Inspect specified and ACI 318 material requirements and specified placement tolerances.
2. Welding: Inspect welds according to AWS D1.1.
3. Periodic Placement Inspection: Inspect for correct materials, fabrication, sizes, locations, spacing, concrete cover, and splicing.
4. Weldability Inspection: Inspect for reinforcement weldability if formed from steel other than ASTM A706.
5. Continuous Weld Inspection: Inspect reinforcement according to ACI 318.
6. Periodic Weld Inspection: Inspect other welded connections.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Provide all materials and labor necessary to complete all concrete, plain and reinforced, as indicated on Drawings or as specified in these specifications and as required to complete the Project. Work, without limiting the generality thereof, includes:

1. Installation of concrete to provide pile caps, transfer beams, grade beams, footings, foundations, suspended slabs, building walls, elevator shaft walls, retaining walls, slabs on grade, electrical ductbanks, and other incidental concrete Work.
2. Setting of utility structures to grade, setting of granite curb, setting of precast concrete curb, grouting around pipe at manholes, manhole bases, and general repairs caused by utility Work.
3. Installation of concrete to provide bridge abutments, water retention vaults, sewage vaults, sewage clarifiers, and tunnel structures.
4. Concrete slurry wall construction.
5. Mass concrete foundations and related structures.
6. Lightweight concrete at new composite slab locations.
7. Concrete pads for mechanical equipment.
8. Concrete fill in steel stairs.
9. Furnishing and installation of admixtures.
10. Work of other trades required to be built into concrete, such as inserts for connections to steel members, waterstops, flashing reglets, anchors, embedded plates, and reinforcing dowels.
11. Providing vapor retarder or waterproofing membrane below slabs on grade.
12. Finishing of concrete as specified herein or as indicated on Drawings.

B. Related Requirements:

1. Section 03 10 00 - Concrete Forming and Accessories: Formwork and accessories Placement of joint devices in formwork Placement of joint device anchors in formwork.
2. Section 03 20 00 - Concrete Reinforcing: Requirements for reinforcing steel and supports.
3. Section 31 23 16 - Excavation.
4. Section 31 23 23 - Fill.
5. Section 32 13 13 - Concrete Paving: Concrete pavement and walks.
6. Section 32 16 23 - Sidewalks: Concrete paving for sidewalks.
7. Section 33 05 61 - Concrete Manholes.

1.02 DEFINITIONS

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

B. Conventional Concrete: A type of concrete that has a specified compressive strength of less than 8,000 psi.

C. High-Strength Concrete (HSC): A type of concrete that has a specified compressive strength of 8,000 psi or greater.

D. Self-Consolidating Concrete (SCC**)**: A type of highly flowable, nonsegregating concrete that can spread into place, fill formwork, and encapsulate reinforcement without any mechanical consolidation.

E. Strain Hardening: The ability to carry increasing tensile load beyond the point of first crack.

F. Strain Softening: The ability to carry a reduced (but nonzero) tensile load beyond the point of first crack.

G. Ultra-High-Performance Concrete: A type of concrete that has a minimum specified compressive strength of 22,000 psi with specified durability, tensile ductility, and toughness requirements; fibers are generally included to achieve specified requirements.

H. Water-Cementitious Materials Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.03 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials (AASHTO):

1. AASHTO M182 - Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats.

B. American Concrete Institute:

1. ACI 239R - Ultra-High-Performance Concrete: An Emerging Technology Report.
2. ACI 301 (301M) - Specifications for Structural Concrete.
3. ACI 305R - Guide to Hot Weather Concreting.
4. ACI 306.1 - Standard Specification for Cold Weather Concreting.
5. ACI 306R - Guide to Cold Weather Concreting.
6. ACI 308.1 (308.1M) - Specification for Curing Concrete.
7. ACI 318 (318M) - Building Code Requirements for Structural Concrete.
8. ACI 350.5 (350.5M) - Specifications for Environmental Concrete Structures.

C. ASTM International:

1. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
2. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
3. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
4. ASTM C42/C42M - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
5. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
6. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.
7. ASTM C150/C150M - Standard Specification for Portland Cement.
8. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
9. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete.
10. ASTM C231/C231M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
11. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete.
12. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete.
13. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
14. ASTM C595/C595M - Standard Specification for Blended Hydraulic Cements.
15. ASTM C845/C845M - Standard Specification for Expansive Hydraulic Cement.
16. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete.
17. ASTM C1157/C1157M - Standard Performance Specification for Hydraulic Cement.
18. ASTM C1218/C1218M - Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.
19. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
20. ASTM D994/D994M - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
21. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
22. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
23. .
24. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
25. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
26. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

## 1.04 COORDINATION

A. Coordinate placement of control and expansion joint devices with erection of concrete formwork and placement of form accessories.

1.05 SUBMITTALS

A. Product Data: Submit data on the following:

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Silica fume.
6. Performance-based hydraulic cement.
7. Aggregates.
8. Admixtures:

    a. Include limitations of use, such as restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
9. Fiber reinforcement.
10. Vapor retarders or waterproof membranes.
11. Curing materials:
12. Joint fillers.
13. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum water-cementitious materials ratio.
5. Calculated equilibrium unit weight for lightweight concrete.
6. Slump limit.
7. Air content.
8. Nominal maximum aggregate size.
9. Steel-fiber reinforcement content.
10. Synthetic micro-fiber content.
11. Indicate amounts of mixing water to be withheld for later addition at Project Site, if permitted.
12. Submit intended placement method.
13. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
14. Submit separate mix designs if admixtures are required for the following:

    a. Hot and cold weather concrete Work.
    b. Air-entrained concrete Work.

C. Qualification Data: Submit data for the following:

1. Installer: Include copies of applicable ACI certificates.

2. Ready-mixed concrete manufacturer.

D. Shop Drawings:

1. Construction Joint Layout:

a. Indicate proposed construction joints required to construct structure.
b. Location of construction joints is subject to approval of Engineer.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Manufacturer Instructions: Submit installation procedures and interfacing required for adjacent Work.

G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

## 1.06 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of embedded utilities and components concealed from view in finished construction.

## 1.07 QUALITY ASSURANCE

A. Concrete Testing Service: Employ and pay an independent testing laboratory, acceptable to the Owner, to perform material evaluation tests and to review concrete mix designs proposed by Contractor to conform to this Specification.

B. Additional Testing and Inspection Services:

1. If required, Owner's testing agency will perform additional testing and inspection services to verify conformance to Contract Documents as listed below:

a. Inspect concrete batching, mixing, and delivery operations.
b. Inspect forms, foundation preparation, reinforcement, embedded items, reinforcement placement, and concrete placing, finishing, and curing operations.
c. Sample concrete at point of placement and other locations as directed by Engineer and perform required tests.
d. Review manufacturer's report for shipment of cement, reinforcement, and prestressing tendons, and conduct laboratory tests or spot checks of materials received for compliance with specifications.
e. Other testing or inspection services as required by Engineer.

2. Provide Owner's testing agency with requested documentation and access to perform testing and inspection activities.

C. Industry Standards: Maintain one copy of each standard affecting Work of this Section on Site.

## PART 2 - PRODUCTS

### 2.01 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

### 2.02 CONCRETE MATERIALS

A. Concrete Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.

3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

B. Concrete Components:

1. Cement:

    a. Comply with ASTM C150/C150M, Type IA - Air Entraining.
    b. Type: Portland.

2. Fly Ash: Comply with ASTM C618, Class C or F.
3. Silica Fume: Comply with ASTM C1240, amorphous silica.

4. Normal Weight Aggregates:

    a. Comply with ASTM C33/C33M coarse aggregate or better, graded. Provide aggregates from a single source.

    b. Coarse Aggregate Maximum Size: Comply with ACI 318.
    c. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

5. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete.

    a. Air-Entraining Admixture: ASTM C260/C260M.
    b. Water-Reducing Admixture: ASTM C494/C494M, Type A.

c. Retarding Admixture: ASTM C494/C494M, Type B.
d. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
e. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
f. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.

1) Substitutions: As specified in Section 01 60 00 - Product Requirements.

2) Furnish materials according to NYSDOT standards.

6. Water and Water Used to Make Ice: ASTM C94/C94M, potable.

## 2.03 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A; not less than 8 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Substitutions: As specified in Section 01 60 00 - Product Requirements.

2. Furnish materials according to NYSDOT standards.

## 2.04 CURING MATERIALS

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

1. Substitutions: As specified in Section 01 60 00 - Product Requirements.

B. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.

1. Substitutions: As specified in Section 01 60 00 - Product Requirements.

2. Furnish materials according to NYSDOT standards.

## 2.05 RELATED MATERIALS

A. Joint Devices and Filler:

1. Joint Filler, Type A:

a. Description: Asphalt-impregnated fiberboard or felt.
b. Comply with ASTM D1751.
c. Thickness: 1/4 inch.
d. Profile: Tongue-and-groove.

2. Joint Filler, Type B:

a. Description: Recycled PVC.
b. Comply with ASTM D1752.
c. Thickness: 1/4 inch.

B. Nonshrink Grout:

1. Substitutions: As specified in Section 01 60 00 - Product Requirements.
2. Furnish materials according to NYSDOT standards.
3. Comply with ASTM C1107/C1107M.
4. Minimum Compressive Strength: 2,400 psi in 48 hours and 7,000 psi in 28 days.

## 2.06 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:

1. Fly Ash or Other Pozzolans: 25 percent by mass.

2. Slag Cement: 50 percent by mass.
3. Silica Fume: 10 percent by mass.
4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass, and silica fume not exceeding 10 percent by mass.
5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass, and silica fume not exceeding 10 percent by mass.

C. Admixtures: Use in accordance with manufacturer's written instructions.

## 2.07 CONCRETE MIXTURES

A. Performance and Design Criteria:
1. Compressive Strength: 4500 psi at 28 days.
2. Cement Type: ASTM C150/C150M.
3. Aggregate Type: Normal weight.
4. Macro-fiber Reinforcement: 2 percent by volume.
5. Maximum Water-Cementitious Materials Ratio: 0.45 by weight.
6. Aggregate Size:

a. Maximum: 3/4 inch.

7. Air Content: 5.5 percent, plus or minus 1.5 percent.
8. Slump: 4 inches, plus or minus 1 inch.

## 2.08 CONCRETE MIXING

A. Ready-Mix Concrete: Comply with requirements of ASTM C94/C94M, and as herein specified. Delete references for allowing additional water to be added to batch for material with insufficient slump. Addition of water to the batch will not be permitted.

1. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94/C94M may be required. When air temperature is between 85 deg. F and 90 deg. F, reduce mixing and delivery time from 90 minutes to 75 minutes, and when air temperature is above 90 deg. F, reduce mixing and delivery time to 60 minutes.
2. During cold weather, concrete shall not be mixed while the temperature is below 40 degrees without the permission of the Construction Manager. If permission is granted for mixing under such conditions, aggregates or water, or both, shall be heated and the concrete shall be placed at a temperature between 50 deg. F and 80 deg. F.
3. Retempering of concrete by adding water or any other material is not permitted.

# PART 3 - EXECUTION

## 3.01 EXAMINATION

A. Verification of Conditions:

1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
2. Do not proceed until unsatisfactory conditions have been corrected.

B. Verify requirements for concrete cover over reinforcement.

C. Verify that anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

## 3.02 PREPARATION

A. Previously Placed Concrete:

1. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent.
2. Remove laitance, coatings, and unsound materials.

B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels, and pack solid with nonshrink grout.

C. Remove debris and ice from formwork, reinforcement, and concrete substrates.

D. Remove water from areas receiving concrete before concrete is placed.

E. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:

1. Daily access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project Site during Site curing period for test samples.
4. Security and protection for test samples and for testing and inspection equipment at Project Site.

## 3.03 INSTALLATION OF VAPOR RETARDER

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.

1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
2. Face laps away from exposed direction of concrete pour.

3. Lap joints 6 inches and seal with manufacturer's recommended tape.
4. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
5. Protect vapor retarder during placement of reinforcement and concrete.

a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder in accordance with manufacturer's written instructions.

## 3.04 INSTALLATION

A. Placing Concrete:

1. Place concrete according to ACI 318.
2. Notify testing laboratory and Engineer, minimum 24 hours prior to commencement of operations.
3. Ensure that reinforcement, inserts, embedded parts, formed expansion and contraction joints, and forms are not disturbed during concrete placement.
4. Joint Filler:

a. Separate slabs on grade from vertical surfaces with 1/4-inch-thick joint filler.
b. Extend joint filler from bottom of slab to within 1/4 inch of finished slab surface.

5. Joint Devices:

a. Install joint covers in longest practical length when adjacent construction activity is complete.
b. Apply sealants in joint devices as specified.

6. Deposit concrete at final position, preventing segregation of mix.
7. Place concrete in continuous operation for each panel or section as determined by predetermined joints.
8. Consolidate concrete.
9. Maintain records of concrete placement, including date, location, quantity, air temperature, and test samples taken.
10. Place concrete continuously between predetermined expansion, control, and construction joints.
11. Do not interrupt successive placement and do not permit cold joints to occur.
12. Saw-Cut Joints:

a. Saw-cut joints within 12 hours after placing.
b. Use 3/16-inch-thick blade.
c. Cut into 1/3 depth of slab thickness.

13. Screeding:

a. Screed slabs on grade level.
b. Surface Flatness:

1) Maximum 1/4 inch in 10 feet.

B. Concrete Finishing:

1. Provide formed concrete surfaces to be left exposed with smooth-rubbed finish.
2. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.

a. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

C. Curing and Protection:

1. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
2. Protect concrete footings from freezing for minimum of seven days.
3. Maintain concrete with minimal moisture loss at relatively constant temperature for period as necessary for hydration of cement and hardening of concrete.
4. Cure concrete according to ACI 308.1 using method.

5. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

    a. Recoat areas subject to heavy rainfall within three hours after initial application.
    b. Maintain continuity of coating and repair damage during curing period.

## 3.05 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

C. Inspection and Testing: Performed by Owner's testing laboratory according to ACI 318.

D. Provide unrestricted access to Work and cooperate with appointed testing and inspection firm.

E. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of Work.

F. Concrete Inspections:

1. Continuous Placement Inspection: Inspect for proper installation procedures.
2. Periodic Curing Inspection: Inspect for specified curing temperature and procedures.

G. Strength Test Samples:

1. Sampling Procedures: Comply with ASTM C172.
2. Cylinder Molding and Curing Procedures:

    a. Comply with ASTM C31/C31M).
    b. Cylinder Specimens: Field cured.

3. Sample concrete and make one set of four cylinders for every 25 cu. yd. or less of each class of concrete placed each day, and for every 5,000 sq. ft. of surface area for slabs and walls.
4. If volume of concrete for a class of concrete would provide less than five sets of cylinders, take samples from five randomly selected batches, or from every batch if less than five batches are used.
5. Make one additional cylinder during cold weather concreting and field cure.

H. Field Testing:

1. Slump Test Method: Comply with ASTM C143/C143M.
2. Air Content Test Method: Comply with ASTM C231.
3. Temperature Test Method: Comply with ASTM C1064.
4. Compressive Strength Concrete:

a. Measure slump and temperature for each sample.
b. Measure air content in air-entrained concrete for each sample.

I. Cylinder Compressive Strength Testing:

1. Test Method: Comply with ASTM C39/C39M.
2. Test Acceptance: According to ACI 318.
3. Test one cylinder at seven days.
4. Test two cylinders at 28 days.
5. Retain one cylinder for 56 days for testing when requested by Engineer.
6. Dispose of remaining cylinders if testing is not required.

J. Core Compressive Strength Testing:

1. Sampling and Testing Procedures: Comply with ASTM C42/C42M.
2. Test Acceptance: According to ACI 318.
3. Drill three cores for each failed strength test from failed concrete.

K. Patching:

1. Allow Engineer to inspect concrete surfaces immediately upon removal of forms.
2. Honeycombing or Embedded Debris in Concrete:

a. Not acceptable.
b. Notify Engineer upon discovery.

3. Patch imperfections as directed by Engineer according to ACI 318.

L. Defective Concrete:

1. Description: Concrete not conforming to required lines, details, dimensions, tolerances, or specified requirements.
2. Repair or replacement of defective concrete will be determined by Engineer.
3. Do not patch, fill, touch up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

END OF SECTION

# SECTION 05 52 00 - METAL RAILINGS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Aluminum tube railings, balusters, and fittings.
   2. Handrails.

B. Related Requirements:
   1. Section 03 30 00 - Cast-In-Place Concrete: Execution requirements for placement of anchors, as specified in this Section, in concrete.

### 1.2 REFERENCE STANDARDS

A. Aluminum Association:
   1. AA ADM 1 - Aluminum Design Manual.
   2. AA ASM 35 - Aluminum Sheet Metal Work in Building Construction.

B. American Architectural Manufacturers Association:
   1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
   2. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
   3. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

C. ASTM International:
   1. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire.
   2. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   3. ASTM B241 - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
   4. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.

D. National Association of Architectural Metal Manufacturers:
   1. NAAMM Metal Finishes Manual.

E. National Ornamental & Miscellaneous Metals Association:
   1. NOMMA Guideline 1 - Joint Finishes.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

E. Qualifications Statements:
   1. Submit qualifications for fabricator and erector.
   2. Submit manufacturer's approval of fabricator and erector.

1.4 QUALITY ASSURANCE

A. Perform Work for structural aluminum according to AA ADM 1.

B. Perform Work of this Section according to ASTM E985.

C. Finish joints according to NOMMA Guideline 1.

D. Perform Work according to New York State standards.

E. Maintain one copy of each standard affecting the Work of this Section On-Site.

1.5 QUALIFICATIONS

A. Fabricator: Company specializing in fabricating products specified in this Section with minimum three years' documented experience.

B. Erector: Company specializing in performing Work of this Section with minimum three years' documented experience.

1.6 EXISTING CONDITIONS

A. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN CRITERIA

A. Design handrail, guardrail, and attachments to resist forces as required by applicable code. Apply loads non-simultaneously to produce maximum stresses.
   1. Guard Top Rail and Handrail Concentrated Load: 200 lb. applied at any point in any direction.
   2. Guard Top Rail Uniform Load: 50 plf applied in any direction.
   3. Intermediate Rails, Panels, and Baluster Concentrated Load: 50 lb. applied to 1 sq. ft. area.

2.2 MATERIALS

A. Aluminum Railing System:
   1. Rails and Posts: 1-1/2 - inch diameter, extruded tubing conforming to ASTM B211 and ASTM B221.
   2. Posts: 2-by-2-1/2-inch size, extruded tubing conforming to ASTM B211 and ASTM B221.
   3. Fittings: Elbows, T-shapes, wall brackets, escutcheons; machined aluminum.
   4. Mounting: Adjustable brackets and flanges, with aluminum brackets for embedding into masonry.
   5. Splice Connectors: Concealed spigot; machined aluminum.
   6. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.
   7. Finish coatings to conform to AAMA 611 and AAMA 2603.
   8. Apply one coat of bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

2.3 FABRICATION

A. Fit and shop-assemble components in largest practical sizes for delivery to Site.

B. Fabricate components with joints tightly fitted and secured. Furnish spigots and sleeves to accommodate Site assembly and installation.

C. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of pipe.

D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

F. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations not encouraging water intrusion.

G. Interior Components: Continuously seal joined pieces by continuous welds.

H. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

I. Accurately form components to suit stairs and landings, to each other and to building structure.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that field conditions are acceptable and are ready to receive Work.

C. Verify that concealed blocking and reinforcement are installed and correctly located to receive wall-mounted handrails.

### 3.2 PREPARATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Clean and strip aluminum where Site welding is required.

C. Supply items required to be cast into concrete and embedded in masonry with setting templates to appropriate Sections.

### 3.3 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Anchor railings to structure with anchors, and concrete foundations.

C. Field-weld anchors as indicated on Shop Drawings. Touch up welds with primer. Grind welds smooth.

D. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

E. Assemble with spigots and sleeves to accommodate tight joints and secure installation.

3.4 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.

B. Maximum Variation from Plumb: 1/8 inch per story, noncumulative.

C. Maximum Offset from Alignment: 1/8 inch.

D. Maximum Out-of-Position: 1/8 inch.

END OF SECTION 05 52 00

# SECTION 31 05 13

# SOILS FOR EARTHWORK

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Subsoil.
2. Topsoil.

B. Related Requirements:

1. Section 31 05 16 "Aggregates for Earthwork" for coarse and fine aggregate materials.
2. Section 31 22 13 "Rough Grading" for removal of topsoil, rough grading, and filling associated with contouring of Site.
3. Section 31 23 16 "Excavation" for excavating as required for building foundations and utilities within building perimeter.
4. Section 31 23 16.13 "Trenching" for excavating as required for building foundations and utilities within building perimeter.
5. Section 31 23 23 "Fill" for backfilling as required at building perimeter and Site structures to subgrade elevations.
6. Section 32 05 13 "Soils for Exterior Improvements" for subsoil and topsoil materials.
7. Section 32 05 16 "Aggregates for Exterior Improvements" for coarse and fine aggregate materials.
8. Section 32 91 19 "Landscape Grading" for placing, leveling, and compacting topsoil materials prior to final landscaping Work.
9. Section 32 92 19 "Seeding" for fertilizing, seeding, hydroseeding, mulching, and maintenance.
10. Section 32 92 23 "Sodding" for preparation of subsoil, placement of topsoil, fertilization, sod installation, and maintenance.

### 1.02 SUBMITTALS

A. Product Data:

1. Subsoil.
2. Topsoil.

B. Samples: Submit, in airtight containers, 10-lb. sample of each type of fill to testing laboratory.

C. Source Quality-Control Reports: For subsoil and topsoil materials.

1.03 QUALITY ASSURANCE

A. Furnish each subsoil and topsoil material from single source throughout Work.

B. Perform Work according to The State of New York Department of Transportation standards.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Perform Work according to:

1. The State of New York Department of Transportation standards.

2.02 SUBSOIL

A. Type S1: Comply with NYS DOT standard.

1. An excavated and re-used material or imported Select borrow free of lumps and debris conforming to New York State Department of Transportation Standard Specifications for Construction Materials Item 304-2.02 Type 4.
2. Material shall meet the following gradation as determined by ASTM C136:

a. Percent Passing by Weight Per Sieve Size:

1) 2 Inches (75 mm): 100.
2) ¼ Inch 30 to 65:
3) No. 40 (4.75 mm): 5 to 40.
4) No. 200 (4.75 mm): 0 to 10

3. Conforming to ASTM D2487 Group Symbol CL.
4. Where Engineer elects to test for this requirement, particles shall not have a loss, after four (4) cycles of the Magnesium Sulfate Soundness Test in accordance with ASTM Designation. C 88 (latest issue), exceeding 20 percent by weight; and the particles passing the No. 40 sieve shall have a Maximum Plasticity Index of 5.0.

B. Type S2:

1. An excavated and re-used material or imported Select borrow free of lumps and debris.
2. Material shall consist solely of a sound, hard, durable stone, run of bank gravel, sand, blast furnace slag or stone, or other acceptable, granular material meeting the following gradation as determined by ASTM C136 as follows:

a. Percent Passing by Weight Per Sieve Size:

1) 3 Inches (75 mm): 100.
2) 1/4 Inch 25 to 90:

3) No. 40 (4.75 mm): 5 to 40.

4) No. 200 (4.75 mm): 0 to 10

3. Conforming to ASTM D2487 Group Symbol CL.
4. Where Engineer elects to test for this requirement, particles shall not have a loss, after four (4) cycles of the Magnesium Sulfate Soundness Test in accordance with ASTM Designation. C 88 (latest issue), exceeding 20 percent by weight; and the particles passing the No. 40 sieve shall have a Maximum Plasticity Index of 5.0.

C. Type S3:

1. An excavated and re-used material or imported Ordinary borrow free of lumps and debris:
2. Material shall consist solely of a sound, hard, durable stone, run of bank gravel, sand, blast furnace slag or stone, or other acceptable, granular material meeting the following gradation as determined by ASTM C136 as follows:

a. Percent Passing by Weight Per Sieve Size:

1) 2 Inches (50 mm): 100.
2) No. 40 (4.75 mm): 5 to 40.
3) No. 200 (75 micro m): 0 to 35.

3. Conforming to ASTM D2487 Group Symbol CL.
4. Where Engineer elects to test for this requirement, particles shall not have a loss, after four (4) cycles of the Magnesium Sulfate Soundness Test in accordance with ASTM Designation. C 88 (latest issue), exceeding 20 percent by weight; and the particles passing the No. 40 sieve shall have a Maximum Plasticity Index of 5.0.

D. Type S4:

1. An excavated and re-used material or imported borrow shall be crushed limestone.
2. Material shall consist solely of an approved stone which is the product of crushing limestone meeting the following gradation as determined by ASTM-C136 as follows.

a. Percent Passing by Weight Per Sieve Size:

1) 2 Inch (12 mm): 100.
2) 3/4 Inch (10 mm): 75 to 90.
3) 1/4 Inch (10 mm): 25 to 60.
4) No. 40 (4.75 mm): 5 to 40.
5) No. 200 (75 micro m): 0 to 10.

3. Conforming to ASTM D2487 Group Symbol CL.
4. Where Engineer elects to test for this requirement, particles shall not have a loss, after four (4) cycles of the Magnesium Sulfate Soundness Test in accordance with ASTM Designation. C 88 (latest issue), exceeding 20 percent by weight; and the particles passing the No. 40 sieve shall have a Maximum Plasticity Index of 5.0.

E. Type S5:

1. An excavated and re-used material or imported borrow conforming to New York State Department of Transportation Standard Specifications for Construction Materials Item 304-2.02 Type 2.
2. Material shall consist solely of approved blast furnace slag or stone which is the product of crushing ledge rock meeting the following gradation as determined by ASTM-C136 as follows.

    a. Percent Passing by Weight Per Sieve Size:

        1) 2 Inches (100 mm): 100.
        2) 1/4 Inch (12 mm): 25 to 60.
        3) No. 40 (4.75 mm): 5 to 40.
        4) No. 200 (75 micro m): 0 to 10

3. Conforming to ASTM D2487 Group Symbol CL.
4. Where Engineer elects to test for this requirement, particles shall not have a loss, after four (4) cycles of the Magnesium Sulfate Soundness Test in accordance with ASTM Designation. C 88 (latest issue), exceeding 20 percent by weight; and the particles passing the No. 40 sieve shall have a Maximum Plasticity Index of 5.0.

2.03 TOPSOIL

A. Type S6: Comply with NYS DOT standard standard.

1. An excavated and re-used onsite material or imported borrow.
2. Topsoil may be naturally occurring or may be manufactured and shall be free from refuse, material toxic or otherwise deleterious to plant growth, subsoil, woody vegetation and stumps, roots, brush, stones, clay lumps or similar objects. Manufactured topsoil shall consist of a mineral component and amendments to meet the specified organic content, pH and other requirements. Sod and herbaceous growth such as grass and weeds need not be removed but shall be thoroughly broken up and mixed with the soil during handling or manufacturing operations.
3. Sandy loam conforming to ASTM D2487 Group Symbol OH.
4. Reasonably free of roots, rocks larger than 1/2-inch, subsoil, debris, large weeds, and foreign matter.
5. Screening: Single screened or rock picked and meet the following gradation:

    a. Percent Passing by Weight Per Sieve Size:

        1) 3/4 Inch (12 mm): 100.
        2) 1/4 Inch (12 mm): 85 to 100.
        3) No. 200 (53 micro m): 20 to 80 (of the 1/4 Inch Sieve).

6. Acidity range (pH) of 5.5 to 7.6 as determined by ASTM D-4972.
7. Containing minimum of 5 percent and maximum of 10 percent inorganic matter as determined by ASTM D-2974.
8. If organic amendments are needed to obtain the specified organic matter content of the onsite topsoil, the organic matter source may be a peat or compost material. The peat shall be a Canadian sphagnum peat having an ash content not exceeding 15%, as determined by ASTM

D-2974. Composts may be used, provided that the material has been composted in an in-vessel system and has an ash content not exceeding 40%.

9. Excess topsoil will be the property of CONTRACTOR and shall be removed from the project site.
10. Limit decaying matter to 10 percent of total content by volume.

B. Type S7: Comply with NYS DOT standard.

1. An imported topsoil conforming to New York State Department of Transportation Standard Specifications for Construction Materials Section 713-01 Topsoil.
2. Topsoil may be naturally occurring or may be manufactured and shall be free from refuse, material toxic or otherwise deleterious to plant growth, subsoil, woody vegetation and stumps, roots, brush, stones, clay lumps or similar objects. Manufactured topsoil shall consist of a mineral component and amendments to meet the specified organic content, pH and other requirements. Sod and herbaceous growth such as grass and weeds need not be removed but shall be thoroughly broken up and mixed with the soil during handling or manufacturing operations.
3. Topsoil shall be single screened, or rock picked and meet the following gradation

    a. Percent Passing by Weight Per Sieve Size:

        1) 2 Inch (12 mm): 100.
        2) 1 Inch (12 mm): 85 to 100.
        3) 1/4 Inch 65 to 100**.**
        4) No. 200 20 to 80**.**

4. Friable loam conforming to ASTM D2487 Group Symbol OH.
5. Reasonably free of roots, rocks larger than 1inch, subsoil, debris, large weeds, and foreign matter.
6. Acidity range (pH) of 5.5 to 7.6 as determined by ASTM D-4972:
7. Containing minimum of 2 percent and maximum of 12 percent inorganic matter as determined by ASTM D-2974.

2.04 SOURCE QUALITY CONTROL

A. Testing and Analysis:

1. Subsoil Material: Comply with ASTM D1557.
2. Topsoil Material: Comply with ASTM D698.
3. If tests indicate materials do not meet specified requirements, change material and retest.

B. Certificate of Compliance:

1. If supplier is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at source conforms to Contract Documents.
2. Specified source tests are not required for Work performed by approved supplier.

PART 3 - EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION OF SUBSOIL AND TOPSOIL

A. Excavation:

1. Excavate subsoil and topsoil from designated areas.
2. Strip topsoil to full depth of topsoil in designated areas.
3. Remove excess excavated materials not intended for reuse from Site.
4. Remove excavated materials not meeting requirements for subsoil and topsoil materials from Site.

B. Stockpiling:

1. Stockpile excavated material meeting requirements for subsoil and topsoil materials.
2. Stockpile materials on Site at locations as designated by Engineer.
3. Stockpile in sufficient quantities to meet Project schedule and requirements.
4. Separate differing materials with dividers or stockpile apart to prevent intermixing of soil types or contamination.
5. Stockpile topsoil maximum 8 feet high.
6. Direct surface water away from stockpile to prevent erosion or deterioration of materials.
7. Stockpile unsuitable and/or hazardous materials on impervious material and cover to prevent erosion and leaching until they are disposed.

3.03 CLEANING

A. Stockpile:

1. Remove stockpile and leave area in clean and neat condition.

a. Grade Site surface to prevent freestanding surface water.

END OF SECTION

SECTION 31 05 16

AGGREGATES FOR EARTHWORK

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Coarse aggregate.
2. Fine aggregate.

B. Related Requirements:

1. Section 31 05 13 "Soils for Earthwork" for granular fill, topsoil, and grading materials.
2. Section 31 22 13 "Rough Grading" for removal of topsoil, rough grading, and filling associated with contouring of Site.
3. Section 31 23 16 "Excavation" for excavating as required for building foundations and utilities within building perimeter.
4. Section 31 23 16.13 "Trenching" for excavating as required for building foundations and utilities within building perimeter.
5. Section 31 23 23 "Fill" for backfilling as required at building perimeter and Site structures to subgrade elevations.
6. Section 32 05 13 "Soils for Exterior Improvements" for subsoil and topsoil materials.
7. Section 32 05 16 "Aggregates for Exterior Improvements" for coarse and fine aggregate materials.
8. Section 32 11 23 "Aggregate Base Courses" for subbase and base course for placement under asphalt or concrete paving, unit paving, or placed and left exposed.
9. Section 32 91 19 "Landscape Grading" for placing, leveling, and compacting topsoil materials prior to final landscaping Work.
10. Section 33 42 00 "Stormwater Conveyance" for drainage facilities to collect and provide for the flow of stormwater.

1.02 SUBMITTALS

A. Product Data:

1. Fine aggregate.
2. Coarse aggregate.
3. Submit name of imported materials source.

B. Samples: Submit, in airtight containers, 10-lb. sample of each type of aggregate to testing laboratory.

C. Source Quality-Control Reports: For fine- and coarse-aggregate materials.

1.03 QUALITY ASSURANCE

A. Furnish each coarse- and fine-aggregate material from single source throughout Work.

B. Perform Work according to NYS DOT standards.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Perform Work according to:

1. The State of New York Department of Transportation standards.

2.02 COARSE AGGREGATE

A. Type A1:

1. Description: Crushed gravel.
2. Washed Stone: Angular crushed.
3. Quality: Free of shale, clay, friable material, and debris.
4. Grading:

a. Comply with ASTM C136/C136M.
b. Percent Passing According to Sieve Size:

1) 1 1/2 Inch: 100.
2) 1 Inch 90 to 100.
3) 1/2 Inch 0 to 15
4) No. 200: 0 to 1.

B. Type A2:

1. Description: Crushed gravel.
2. Washed Stone: Angular crushed.
3. Quality: Free of shale, clay, friable material, and debris.
4. Grading:

a. Comply with ASTM C136/C136M.
b. Percent Passing According to Sieve Size:

1) 1 Inch 100.
2) 1/2 Inch 90 to 100.
3) 1/4 Inch: 0 to 15.
4) No. 200: 0 to 1.

C. Type A3:

1. Description: Crushed gravel.
2. Washed Stone: Angular crushed.
3. Quality: Free of shale, clay, friable material, and debris.
4. Grading:

a. Comply with ASTM C136/C136M:
b. Percent Passing According to Sieve Size:

1) 1/2 Inch: 100.
2) 1/4 Inch: 90 to 100.
3) 1/8 Inch: 0 to 15.
4) No. 200 (75 micro m): 0 to 1.

D. Type A4 Pea Gravel:

1. Stone: Natural and washed.
2. Quality: Free of clay, shale, and organic matter.
3. Grading:

a. Comply with ASTM C136/C136M.
b. Maximum Size: 3/8 inch.

## 2.03 SOURCE QUALITY CONTROL

A. Testing and Analysis:

1. Coarse-Aggregate Material: Comply with ASTM D1557.
2. Fine-Aggregate Material: Perform according to ASTM D1557.
3. If tests indicate materials do not meet specified requirements, change material and retest.

B. Certificate of Compliance:

1. If supplier is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at source conforms to Contract Documents.
2. Specified source tests are not required for Work performed by approved supplier.

# PART 3 - EXECUTION

## 3.01 EXAMINATION

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

## 3.02 INSTALLATION OF COARSE AGGREGATE AND FINE AGGREGATE

A. Excavation:

1. Excavate aggregate materials from Site locations as indicated and as specified in Section 312213 "Rough Grading, 312316 "Excavation, and 312316.13 "Trenching."
2. Remove excess excavated coarse-aggregate and fine-aggregate materials not intended for reuse from Site.
3. Remove excavated materials not meeting requirements for coarse aggregate and fine aggregate from Site.

B. Stockpiling:

1. Stockpile materials on Site at locations as designated by Engineer.
2. Stockpile excavated material meeting requirements for coarse-aggregate and fine-aggregate materials.
3. Stockpile in sufficient quantities to meet Project schedule and requirements.
4. Separate different aggregate materials with dividers or stockpile apart to prevent intermixing of aggregate types or contamination.
5. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
6. Stockpile unsuitable and hazardous materials on impervious material and cover to prevent erosion and leaching until they are disposed.

## 3.03 CLEANING

A. Stockpile:

1. Remove stockpile and leave area in clean and neat condition.

    a. Grade Site surface to prevent freestanding surface water.

2. Leave unused materials in neat, compact stockpile.

END OF SECTION

SECTION 31 05 19.13

GEOTEXTILES FOR EARTHWORK

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Nonwoven geotextile materials.

B. Related Requirements:

1. Section 31 05 13 "Soils for Earthwork" for fill and grading materials.
2. Section 31 05 16 "Aggregates for Earthwork" for fill and base coarse materials, and for fill over woven geotextiles at roadway applications.
3. Section 31 23 16.13 "Trenching" for soil and subsoil materials for fill and grading purposes.
4. Section 31 23 23 "Fill" for backfilling required at building perimeter and Site structures to subgrade elevations; fill under slabs on grade, pavement, and landscaped areas.
5. Section 31 25 00 "Erosion and Sedimentation Controls" for erosion and sedimentation control devices.
6. Section 32 05 13 "Soils for Exterior Improvements" for soil and subsoil materials for fill and grading purposes.
7. Section 32 05 16 "Aggregates for Exterior Improvements" for coarse and fine aggregate materials for fill and grading purposes.
8. Section 32 11 23 "Aggregate Base Courses" for subbase and base course for placement under paving.
9. Section 32 91 19 "Landscape Grading" for placing, leveling, and compacting topsoil materials prior to final landscaping.

1.02 SUBMITTALS

A. Product Data: For the following:

1. Nonwoven geotextile materials.
2. Woven geotextiles for erosion control.
3. Submit manufacturer information including tensile strength, elongation, thickness, UV resistance, and other material specifications.
4. Submit testing agency compliance with the Geosynthetic Accreditation Institute's Laboratory Accreditation Program (GAI-LAP).

B. Shop Drawings:

1. Indicate fabric layout, seam locations, and overlap details in installation drawings.
2. Signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples:

1. Submit two samples, full width by 12 inches long, for each type and weight of geotextile used on Project, illustrating thickness, and seaming method.

D. Source Quality-Control Reports: For TRMs and woven and nonwoven geotextiles.

E. Qualifications Statements: For manufacturer, installer, and testing agency.

F. Manufacturer's Approval: For installer.

G. Provide shop inspection and testing of completed assembly. Comply with ASTM D4759.

1.03 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of geotextile materials, including placement depth.

1.04 QUALITY ASSURANCE

A. Manufacturers Qualifications: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

B. Installers Qualifications: Company specializing in performing Work of this Section with minimum three years' documented experience.

C. Licensed Professionals Qualifications: Professional engineer experienced in design of specified Work and licensed in State of New York.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

B. Comply with ASTM D4873.

C. Store materials according to manufacturer instructions.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

PART 2 - PRODUCTS

2.01 NONWOVEN GEOTEXTILE MATERIALS

A. Provide nonwoven geotextile that meets AASHTO M 288 Class 3 requirements for subsurface drainage, separation, and stabilization. Provide multipurpose fabrics with a felt-like appearance. The main functions for these products are filtration and separation. The most common nonwoven is a needle-punched product. Staple fibers or continuous filaments are bonded by mechanically entangling the fibers with barbed needles. Their optimum open area and three-dimensionality provide effective erosion control and vegetation reinforcement, as well as resistance against high flow-induced shear forces. Provide material that has high interlock and reinforcement capacities with both soil and root systems and is designed for erosion control applications on steep slopes and vegetated waterways.

B. Manufacturers:

1. Linq Industrial Fabrics; Style GFT-125EX.
2. ADS; Style 0451T Nonwoven.
3. Winfab; Style 600N.

C. Non-biodegradable, UV-resistant, nonwoven geotextile fabric.

D. Edges: Selvaged or finished to prevent separation of outer material.

E. Calendar such that yarns will retain relative positions.

F. Performance and Design Criteria:

1. Minimum Unseamed Sheet Width: 12.5 by 15 feet.
2. Nominal Weight: 4.2 oz./sq. yd.
3. Apparent Opening Size (AOS):

    a. No 70 U.S. standard sieve size.
    b. Comply with ASTM D4751.

4. Water Permittivity: 1.70 Hz per second, minimum average roll value.
5. Water Flow Rate:

    a. 120 gpm/sq. ft., minimum average roll value.
    b. Comply with ASTM D4491/D4491M.

6. Grab Tensile Strength:

    a. 120 lbf., minimum average roll value.
    b. Comply with ASTM D4632/D4632M.

7. Elongation:

    a. 50 percent, minimum average roll value.

b. Comply with ASTM D4632/D4632M.

8. Trapezoidal Tear Strength:

   a. 50 lbf minimum average roll value.
   b. Comply with ASTM D4533/D4533M.

9. Puncture Strength:

   a. 310 lbf minimum average roll value.
   b. Comply with ASTM D6241.

10. UV Resistance at 500 Hours:

    a. Strength Retention: 70 percent.
    b. Comply with ASTM D4355/D4355M.

2.02 SOURCE QUALITY CONTROL

A. Provide shop inspection and testing of completed assembly. Provide sampling of geosynthetics for testing in compliance with ASTM D4354.

B. Certificate of Compliance:

1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents and GAI-LAP.
2. Specified shop tests are not required for Work performed by approved manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

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

B. Verify that underlying surface is smooth and free of ruts or protrusions that could damage geotextile material.

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

3.02 PREPARATION

A. Subgrade Material and Compaction Requirements: As specified in Section 312316.13 - Trenching and 312323 - Fill.

## 3.03 INSTALLATION OF GEOTEXTILES

A. Geotextile Material:

1. Lay and maintain smooth and free of tensile stresses, folds, wrinkles, or creases.
2. Ensure that material is in direct contact with subgrade.
3. Orientate with long dimension of each sheet transverse to direction of slope.
4. Minimum Unseamed Joints Overlap: 18 inches.

B. Penetrations: As recommended by geotextile manufacturer.

C. Repair Damaged Geotextiles:

1. Repair torn or damaged geotextile by placing patch of same type of geotextile over damaged area minimum of 12 inches beyond edge of damaged area and fasten as recommended by geotextile manufacturer.
2. Remove and replace geotextile rolls which cannot be repaired.

D. Fill and Cover:

1. Place fill to prevent tensile stress or wrinkles in geotextile.
2. Place fill from bottom of side-slopes upward.
3. Do not drop fill from height greater than 3 feet.

## 3.04 FIELD QUALITY CONTROL

A. Testing: As specified in Section 01 40 00 – Quality Requirements.

## 3.05 DEMONSTRATION

A. Equipment Acceptance:

1. Adjust, repair, modify, or replace components failing to perform as specified and rerun tests.
2. Make final adjustments to equipment under direction of manufacturer's representative.

## 3.06 PROTECTION

A. Ballast: Adequate to prevent uplift of material by wind.

B. UV Exposure: Do not leave material uncovered for more than 14 days after installation.

C. Do not use staples or pins to hold geotextiles in place where located adjacent to other geosynthetic layers that could be damaged.

D. Do not operate equipment directly on top of geotextiles.

END OF SECTION

# SECTION 31 10 00

# SITE CLEARING

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Removing surface debris.
2. Removing designated paving, curbs, utility structures, concrete stairs, concrete sidewalks, and other site features.
3. Removing designated trees, shrubs, and other plant life.
4. Removing abandoned utilities.
5. Excavating topsoil.

B. Related Sections:

1. Section 31 22 13 - Rough Grading.

### 1.02 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data for herbicide. Indicate compliance with applicable codes for environmental protection.

### 1.03 QUALITY ASSURANCE

A. Conform to applicable New York State code for environmental requirements and disposal of debris.

B. Perform Work in accordance with State of New York standards.

C. Maintain one copy of document on site.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

A. Herbicide: type, approved by authority having jurisdiction.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify existing plant life designated to remain is tagged or identified.

C. Identify waste area and salvage area for placing removed materials.

3.02 PREPARATION

A. Call Dig Safe New York at 1-800-962-7962 not less than two or more than ten working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.
2. All private utilities on project property shall be located by Contractor at no additional cost to Owner.

3.03 PROTECTION

A. Locate, identify, and protect from damage utilities indicated to remain.

B. Protect trees, plant growth, and features designated to remain, as final landscaping as specified in Section 01 50 00 - Temporary Facilities and Controls.

C. Protect bench marks, survey control points, and existing structures from damage or displacement.

3.04 CLEARING

A. Clear areas required for access to site and execution of Work to minimum depth of 6 inches.

B. Remove trees and shrubs as indicated. Remove stumps, main root ball, and surface rock.

C. Clear undergrowth and deadwood, without disturbing subsoil.

3.05 REMOVAL

A. Remove debris, rock, and extracted plant life from site.

B. Partially remove paving, curbs, utility structures, concrete stairs, concrete sidewalks, and other site features as indicated on Drawings. Neatly saw cut edges at right angle to surface.

C. Remove abandoned utilities. Indicated removal termination point for underground utilities on Record Documents.

D. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.

E. Do not burn or bury materials on site. Leave site in clean condition.

## 3.06 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, relandscaped, or regraded, without mixing with foreign materials for use in finish grading.

B. Do not excavate wet topsoil.

C. Stockpile in area approved by Architect/Engineer designated on site to height not exceeding 8 feet and protect from erosion. Stockpile material on impervious material and cover over with same material, until disposal.

D. Remove excess topsoil not intended for reuse, from Site.

END OF SECTION

SECTION 31 22 13

ROUGH GRADING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Excavating topsoil.
2. Excavating subsoil.
3. Cutting, grading, filling, rough contouring, compacting site for site structures, paving and athletic fields.

B. Related Sections:

1. Section 31 05 13 - Soils for Earthwork: Soils for fill.
2. Section 31 05 16 - Aggregates for Earthwork: Aggregates for fill.
3. Section 31 10 00 - Site Clearing: Excavating topsoil.
4. Section 31 23 16 - Excavation: Building excavation.
5. Section 31 23 16.13 - Trenching: Trenching and backfilling for utilities.
6. Section 31 23 23 - Fill: General building area backfilling.
7. Section 32 91 19 - Landscape Grading: Finish grading with topsoil to contours.

1.02 REFERENCES

A. ASTM International:

1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3).
3. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
4. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3).
5. ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
6. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head).
7. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
8. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.03 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Samples: Submit, in air-tight containers, 10 lb sample of each type of fill to testing laboratory.

C. Materials Source: Submit name of imported materials suppliers.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.04 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

C. All survey operations shall be completed by a Licensed New York State Professional Land Surveyor to provide the following documentation:

1. Survey existing adjacent buildings, structures, and improvements for position and elevation of principal elements before and after completion of operations.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C136, ASTM D2419, and ASTM D2434.

B. Maintain one copy of each document on site.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Topsoil: Type S6 and S7 as specified in Section 310513.

B. Subsoil Fill: Type S2 and S3 as specified in Section 310513.

C. Structural Fill: Type S1 as specified in Section 310513 and Section 310516.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify survey bench mark and intended elevations for the Work are as indicated on Drawings.

## 3.02 PREPARATION

A. Call Dig Safe New York at 1-800-962-7962 not less than two working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.
2. Private utilities shall be located and marked within and surrounding construction areas.

B. All survey operations shall be completed by a Licensed and Registered New York State Professional Land Surveyor to provide following documentation:

1. Survey existing adjacent buildings, structures, and improvements for position and elevation of principal elements before and after completion of operations.

C. Identify required lines, levels, contours, and datum.

D. Protect utilities indicated to remain from damage.

E. Protect plant life, lawns, rock outcropping and other features remaining as portion of final landscaping.

F. Protect bench marks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

## 3.03 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, relandscaped, regraded, and marked areas, entire site, without mixing with foreign materials for use in finish grading.

B. Do not excavate wet topsoil.

C. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion. Stockpile material on impervious material and cover over with same material, until disposal.

D. Remove excess topsoil not intended for reuse, from site.

## 3.04 SUBSOIL EXCAVATION

A. Excavate subsoil from areas to be further excavated, relandscaped, or regraded. and marked areas.

B. Do not excavate wet subsoil or excavate and process wet material to obtain optimum moisture content.

C. When excavating through roots, perform Work by hand and cut roots with sharp axe.

D. Remove excess subsoil not intended for reuse, from site.

E. Stockpile excavated material in area designated on site in accordance with Section 310513.

F. Benching Slopes: Horizontally bench existing slopes greater than 1: 4 to key placed fill material to slope to provide firm bearing.

G. Stability: Replace damaged or displaced subsoil as specified for fill.

3.05 FILLING

A. Fill areas to contours and elevations with unfrozen materials.

B. Place material in continuous layers as follows:

1. Subsoil Fill: Maximum 12 inches compacted depth.
2. Structural Fill: Maximum 8 inches compacted depth.

C. Maintain optimum moisture content of fill materials to attain required compaction density.

D. Slope grade away from building minimum 2 percent slope for minimum distance of 10 ft, unless noted otherwise.

E. Make grade changes gradual. Blend slope into level areas.

F. Repair or replace items indicated to remain damaged by excavation or filling.

3.06 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

3.07 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements and 017000 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Perform laboratory material tests in accordance with ASTM D1557.

C. Perform in place compaction tests in accordance with the following:

1. Density Tests: ASTM D2922.
2. Moisture Tests: ASTM D3017.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

E. Frequency of Tests: 250 sq.ft per lift.

3.08 SCHEDULES

A. Structural Fill:

1. Fill Type S1: To subgrade elevation.
2. Compact uniformly to minimum 97 percent of maximum density.

B. Subsoil Fill:

1. Fill Type S2 and S3: To subgrade elevation.
2. Compact uniformly to minimum 97 percent of maximum density.

C. Topsoil Fill:

1. Fill Type S6 and S7: To finished elevation.
2. Compact uniformly to minimum 95 percent of maximum density.

END OF SECTION

SECTION 31 23 16

EXCAVATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Soil densification.
2. Excavating for building foundations.
3. Excavating for paving, roads, and parking areas.
4. Excavating for slabs on grade.
5. Excavating for Site structures.
6. Excavating for landscaping.

B. Related Requirements:

1. Section 31 05 13 "Soils for Earthwork" for stockpiling of fill and grading materials.
2. Section 31 05 16 "Aggregates for Earthwork" for stockpiling of coarse- and fine-aggregate materials.
3. Section 31 22 13 "Rough Grading" for topsoil and subsoil removal from Site surface.
4. Section 31 23 16 "Excavating" for excavating for piling.
5. Section 31 23 16.13 "Trenching" for excavating as required for building foundations and utilities within building perimeter.
6. Section 31 23 23 "Fill" for backfilling at building perimeter and Site structures, and fill under slabs on grade, pavement, and landscaped areas.

1.02 SUBMITTALS

A. Shop Drawings:

1. Excavation Protection Plan:

a. Describe sheeting, shoring, and bracing materials and installation, as required, to protect excavations and adjacent structures and property.
b. Submit signed and sealed Shop Drawings with design calculations and assumptions to support plan.

B. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

C. Qualifications Statement: For licensed professional.

1.03 QUALITY ASSURANCE

A. Licensed Professionals Qualifications: Professional engineer experienced in design of specified Work and licensed at Project location in State of New York.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Perform Work according to:

1. The State of New York Department of Transportation standards.

PART 3 - EXECUTION

3.01 PREPARATION

A. Utility Service Locator:

1. Call local utility service-line information Dig Safe New York: 1-800-962-7962 or 811 not less than three working days before performing Work.

a. Request underground utilities to be located and marked within and surrounding construction areas.
b. All private utilities on project property shall be located by Contractor at no additional cost to Owner.

2. Identify required lines, levels, contours, and data.

B. Existing Utilities:

1. Protect from damage utilities indicated to remain.

C. Protect plant life, lawns, rock outcroppings, and other features designated to remain as portion of final landscaping.

D. Protect benchmarks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Do not close or obstruct roadways sidewalks or hydrants without permits.

3.02 TOLERANCES

A. Maximum Deviation from Center of Completed Compaction: 8 inches from indicated position.

B. Maximum Deviation from Vertical: 4 degrees during vibrator insertion.

3.03 EXCAVATION

A. Underpin adjacent structures which may be damaged by excavation Work.

B. Excavate subsoil to accommodate slabs on grade, paving, Site structures, construction operations, and all proposed work.

C. Excavate to working elevation for piling Work.

D. Compact disturbed load-bearing soil in direct contact with foundations to original bearing capacity, as specified in Section 31 23 23 "Fill" and Section 31 23 16.13 "Trenching".

E. Slope banks with machine to angle of repose or less until shored.

F. Do not interfere with 45-degree bearing splay of foundations.

G. Grade top perimeter of excavation to prevent surface water from draining into excavation.

H. Trim excavation and remove loose matter.

I. Removal of Deleterious Materials:

1. Remove lumped subsoil, boulders, and rock up to 1/3 cu. yd., measured by volume.
2. Remove larger material as specified in Section 312323 "Fill".
3. Remove excess and unsuitable material from Site.

J. Notify Architect/Engineer of unexpected subsurface conditions.

K. Correct over-excavated areas with structural fill Type S2 as specified in Section 31 23 23 "Fill" or as directed by Architect/Engineer.

1. Remove excavated material from Site.

L. Repair or replace items indicated to remain that have been damaged by excavation.

3.04 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Request visual inspection of bearing surfaces by Architect/Engineer and inspection agency before installing subsequent Work.

3.05 PROTECTION

A. Prevent displacement or loose soil from falling into excavation and maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

C. Protect structures, utilities, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that may be created by earth operations.

END OF SECTION

SECTION 31 23 16.13

TRENCHING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Excavating trenches for utilities from 5 feet outside building to utility service.
2. Compacted fill from top of utility bedding to subgrade elevations.
3. Backfilling and compaction.

B. Related Sections:

1. Section 31 05 13 - Soils for Earthwork: Soils for fill.
2. Section 31 05 16 - Aggregates for Earthwork: Aggregates for fill.
3. Section 31 22 13 - Rough Grading: Topsoil and subsoil removal from site surface.
4. Section 31 23 16 - Excavation: General building excavation.
5. Section 31 23 23 - Fill: General backfilling.
6. Section 32 91 19 - Landscape Grading: Filling of topsoil over backfilled trenches to finish grade elevation.
7. Section 33 31 00 - Sanitary Utility Sewerage Piping: Sanitary sewer piping and bedding from building to utility service.

1.02 REFERENCES

A. ASTM International:

1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3).
2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3).
3. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.03 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

1.04 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.

C. Product Data: Submit data for geotextile fabric indicating fabric and construction.

D. Samples: Submit, in air-tight containers, 10 lb. sample of each type of fill to testing laboratory.

E. Materials Source: Submit name of imported fill materials suppliers.

F. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Maintain one copy of each document on site.

1.06 QUALIFICATIONS

A. Prepare excavation protection plan under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of New York.

1.07 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.08 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 - PRODUCTS

2.01 FILL MATERIALS

A. Subsoil Fill: Type S2 and S3 as specified in Section 310513.

B. Structural Fill: Type S1 as specified in Section 310513.

2.02 ACCESSORIES

A. Geotextile Fabric: Non-biodegradable, UV-resistant, nonwoven.

B. Manufacturers:

1. Linq Industrial Fabrics; Style GFT-125EX.
2. ADS; Style 0451T Nonwoven.
3. Winfab; Style 600N
4. Substitutions: Section 01 60 00 - Product Requirements.

PART 3 - EXECUTION

3.01 LINES AND GRADES

A. Lay pipes to lines and grades indicated on Drawings.

1. Architect/Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

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

3.02 PREPARATION

A. Call Dig Safe New York at 1-800-962-7962 not less than two working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.
2. Private underground utilities to be located and marked within and surrounding construction area.

B. Identify required lines, levels, contours, and datum locations.

C. Protect plant life, lawns, and other features remaining as portion of final landscaping.

D. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Maintain and protect above and below grade utilities indicated to remain.

F. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.03 TRENCHING

A. Excavate subsoil required for utilities to utility service.

B. Remove lumped subsoil, boulders, and rock up of 1/6 cu. yd., measured by volume. Remove larger material as specified.

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

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

E. Cut trenches to width indicated on Drawings and sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work.

F. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and pipe.

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

H. When Project conditions permit, slope side walls of excavation starting 2 feet above top of pipe. When side walls can not be sloped, provide sheeting and shoring to protect excavation as specified in this section.

I. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by Architect/Engineer.

J. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Fill Type S1 and compact to density equal to or greater than requirements for subsequent backfill material.

K. Trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.

L. Correct areas over excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by Architect/Engineer.

M. Remove excess subsoil not intended for reuse, from site.

## 3.04 SHEETING AND SHORING

A. Sheet, shore, and brace excavations to prevent danger to persons, structures, and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

B. Support trenches more than 4 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.

C. Design sheeting and shoring to be removed at completion of excavation work.

D. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

E. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

## 3.05 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen fill materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

C. Place geotextile fabric prior to placing subsequent fill materials.

D. Place material in continuous layers as follows:

1. Subsoil Fill: Maximum 12 inches compacted depth.
2. Structural Fill: Maximum 8 inches compacted depth.
3. Granular Fill: Maximum 8 inches compacted depth.

E. Employ placement method that does not disturb or damage foundation perimeter drainage, utilities in trench, and previously completed work.

F. Maintain optimum moisture content of fill materials to attain required compaction density.

G. Do not leave more than 10 feet of trench open at end of working day.

H. Protect open trench to prevent danger to Owner and the public.

## 3.06 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Top Surface of Backfilling Under Paved Areas: Plus or minus 0.04 feet from required elevations.

C. Top Surface of General Backfilling: Plus or minus 0.08 feet from required elevations.

## 3.07 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Perform laboratory material tests in accordance with ASTM D1557.

C. Perform in place compaction tests in accordance with the following:

1. Density Tests: ASTM D2922.
2. Moisture Tests: ASTM D3017.

D. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.

E. Frequency of Tests: 250 sf/Lift.

3.08 PROTECTION OF FINISHED WORK

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting finished work.

B. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION

# PART 1 - GENERAL

## 1.1 SUMMARY

A. Section Includes:

1. Removing identified and discovered rock during excavation.
2. Expansive tools to assist rock removal.

B. Related Sections:

1. Section 31 22 13 - Rough Grading.
2. Section 31 23 16 – Excavation.
3. Section 31 23 17 – Trenching.
4. Section 31 23 23 – Fill.

## 1.2 DEFINITIONS

A. Rock: Solid mineral material of size that cannot be removed with 3/4 cu yd capacity excavator.

## 1.3 SCHEDULING

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Schedule Work to avoid working hours and disruption to occupied buildings nearby.

# PART 2 - PRODUCTS

## 2.1 Not used.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify site conditions and note subsurface irregularities affecting Work of this section.

## 3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.

3.3 ROCK REMOVAL BY MECHANICAL METHOD

A. Excavate and remove rock by mechanical method.

1. Drill holes and use expansive tools, wedges, mechanical disintegration compound to fracture rock.

B. Cut away rock at bottom of excavation to form level bearing.

C. Remove shaled layers to provide sound and unshattered base.

D. In utility trenches, excavate to 6 inches below invert elevation of pipe and 24 inches wider than pipe diameter.

E. Remove excavated materials from site.

F. Correct unauthorized rock removal in accordance with backfilling and compacting requirements of Section 31 23 23. with lean concrete fill in accordance with Section 31 23 23 and Section 03 30 00. as directed by Architect/Engineer.

3.4 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements, 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

END OF SECTION 31 23 16.26

SECTION 31 23 23

FILL

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Backfilling building perimeter to subgrade elevations.
2. Backfilling site structures to subgrade elevations.
3. Fill under slabs on grade.
4. Fill under paving.
5. Fill for over-excavation.

B. Related Requirements:
1. Section 31 05 13 - Soils for Earthwork: Soils for fill.
2. Section 31 05 16 - Aggregates for Earthwork: Aggregates for fill.
3. Section 31 05 19.13 - Geotextiles for Earthwork: Geotextile fabric for placement over fill.
4. Section 31 22 13 - Rough Grading: Site filling.
5. Section 31 23 16 - Excavation: Backfilling of building foundations and utilities within building perimeter.
6. Section 31 23 16.13 - Trenching: Backfilling of utility trenches.
7. Section 32 91 19 - Landscape Grading: Placing, leveling, and compacting topsoil materials prior to final landscaping Work.
8. Section 33 42 00 - Stormwater Conveyance: Drainage facilities to collect and provide for flow of stormwater.

1.02 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:

1. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg Rammer and a 457-mm Drop.

B. ASTM International:

1. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3).
2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3).
3. ASTM D6031/D6031M - Standard Test Method for Logging In Situ Moisture Content and Density of Soil and Rock by the Nuclear Method in Horizontal, Slanted, and Vertical Access Tubes.

4. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.03 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer information for geotextile fabric, indicating fabric and construction.

C. Samples: Submit, in airtight containers, one 10-lb. sample of each type of fill to testing laboratory.

D. Materials Source: Submit name of imported materials suppliers.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.04 QUALITY ASSURANCE

A. Maintain one copy of each standard affecting Work of this Section on Site.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Subsoil Fill: Type S2 and S3, as specified in Section 310513 - Soils for Earthwork.

B. Structural Fill: Type S1, as specified in Section 310513 - Soils for Earthwork 310516 And aggregates for Earthwork.

C. Concrete:

1. Description:

a. Structural, as specified in Section 033000 - Cast-in-Place Concrete.
b. Compressive Strength: 4500 psi.

2.02 ACCESSORIES

A. Geotextile Fabric: As specified in Section 31 05 19.13 - Geotextiles for Earthwork.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that subdrainage, dampproofing, and waterproofing installations have been inspected.

C. Verify that underground tanks are anchored to their own foundations to avoid flotation after backfilling.

D. Verify structural integrity of unsupported walls to support loads imposed by fill.

3.02 PREPARATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Compact subgrade to specified density requirements for subsequent backfill materials.

C. Soft Subgrade:

1. Cut out soft areas of subgrade not capable of compaction in place.
2. Backfill with structural S2 fill and compact to density equal to or greater than specified requirements for subsequent fill material.

D. Scarify subgrade surface to depth of 3 inches.

3.03 BACKFILLING

A. Backfill areas to contours and elevations.

B. Systematically backfill to allow maximum time for natural settlement.

C. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces, and do not backfill with frozen materials.

D. Maximum Compacted Depths:

1. Place material in continuous layers to following depths:

a. Subsoil Fill: 12 inches.
b. Structural Fill: 8 inches.
c. Granular Fill: 8 inches.

E. Use placement method that does not disturb or damage foundation perimeter drainage, utilities in trench, or existing structures.

F. Maintain optimum moisture content of fill materials to attain required compaction density.

G. Structures:

1. Backfill against supported foundation walls and structures.
2. Backfill simultaneously on each side of unsupported foundation walls and structures until supports are in place.

3. Slope grade away from building minimum 2 percent slope for minimum distance of 10 feet.

H. Make gradual grade changes and blend slope into level areas.

I. Remove surplus backfill materials from Site.

J. Leave fill material stockpile areas free of excess fill materials.

## 3.04 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.

B. Top Surface of Backfilling under Paved Areas: Plus or minus 1/2 inch from required elevations.

C. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

## 3.05 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

C. Inspecting: Request visual inspection of bearing surfaces by Owners inspection agency before installing subsequent Work.

D. Testing:

1. Laboratory Material Testing: Comply with ASTM D1557.
2. In-Place Compaction Testing:

    a. Density Tests: Comply with ASTM D6938.
    b. Moisture Tests: Comply with ASTM D6031/D6031M.

3. If tests indicate that Work does not meet specified requirements, remove Work, replace, compact, and retest.
4. Testing Frequency: 250 sf/ Lift.
5. Proof-roll compacted fill surfaces under slabs on grade, paving, and curbs.

3.06 PROTECTION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Reshape and recompact fills subjected to vehicular traffic during construction.

END OF SECTION

SECTION 31 23 23.33

FLOWABLE FILL

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Flowable fill for:

a. Structure backfill.
b. Utility bedding.
c. Utility backfill.
d. Filling abandoned utilities.

B. Related Requirements:

1. Section 31 23 16 - Excavation: General building excavation.
2. Section 31 23 16.13 - Trenching: Soil and aggregate backfill for utility trenches.
3. Section 31 23 23 - Fill: Soil and aggregate backfill for structures.
4. Section 32 91 19 - Landscape Grading: Filling of topsoil over backfilled trenches to finish grade elevation.

1.02 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, manhole, tank, or cable.

B. Excavatable Flowable Fill: Lean cement concrete fill used where future excavation may be required, such as fill for utility trenches, bridge abutments, and culverts.

C. Non-excavatable Flowable Fill: Lean cement concrete fill used where future excavation is not anticipated, such as fill below structure foundations and filling abandoned utilities.

1.03 REFERENCE STANDARDS

A. ASTM International:

1. ASTM C33 - Standard Specification for Concrete Aggregates.
2. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
3. ASTM C150 - Standard Specification for Portland Cement.
4. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
5. ASTM C403/C403M - Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance.

6. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
7. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.

1.04 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

C. Field Quality-Control Submittals:

1. Mix Design:

a. Furnish flowable fill mix design for each specified strength.
b. Furnish separate mix designs when admixtures are required for the following:

1) Flowable fill Work during hot and cold weather.
2) Air entrained flowable fill Work.

c. Identify design mix ingredients, proportions, properties, admixtures, and tests.

2. Furnish test results to certify flowable fill mix design properties meet or exceed specified requirements.

D. Delivery Tickets:

1. Furnish duplicate delivery tickets indicating actual materials delivered to Project Site.

E. Qualifications Statements:

1. Submit qualifications for supplier.

1.05 QUALITY ASSURANCE

A. Maintain one copy of each standard affecting the Work of this Section on Site.

1.06 QUALIFICATIONS

A. Supplier:

1. Company specializing in supplying products specified in this Section with minimum three years' documented experience.
2. Product source approved by authority having jurisdiction.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Section 01 50 00 - Temporary Facilities and Controls specifies ambient condition control facilities for product storage and installation.

B. Minimum Conditions: Do not install flowable fill during inclement weather or when ambient temperature is less than 40 degrees F.

1.08 FIELD MEASUREMENTS

A. Verify field measurements before installing flowable fill to establish quantities required to complete the Work.

PART 2 - PRODUCTS

2.01 ADMIXTURES

A. Air Entrainment: ASTM C260.

B. Fly Ash: ASTM C618 Class F obtained from residue of electric generating plant using ground or powdered coal.

2.02 MIXES

A. Mix and deliver flowable fill according to ASTM C94/C94M, Option C.

B. Flowable Fill Design Mix:

1. Cement Content:

a. Excavatable: 75 to 100 lb/cu yd
b. Non-Excavatable: 100 to 150 lb/cu yd

2. Fly Ash Content:

a. Excavatable: None.
b. Non-Excavatable: 150-600 pcf.

3. Water Content:

a. Excavatable: As specified.
b. Non-Excavatable: As specified.

4. Air Entrainment:

a. Excavatable: 5 to 35 percent.
b. Non-Excavatable: 5 to 15 percent.

5. 28-Day Compressive Strength:

    a. Excavatable: Maximum 100 psi.
    b. Non-Excavatable: Minimum 125 psi.

6. Unit Mass (Wet):

    a. Excavatable: 80 to 110 pcf
    b. Non-Excavatable: 100 to 125 pcf.

7. Temperature, Minimum, at Point of Delivery:

    a. Excavatable: 40 degrees F
    b. Non-Excavatable: 40 degrees F

C. Provide water content in design mix to produce self-leveling, flowable fill material at time of placement.

D. Design mix air entrainment and unit mass are for laboratory design mix and source quality control only.

2.03 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Prepare delivery tickets containing the following information:

1. Project designation.

2. Date.
3. Time.
4. Class and quantity of flowable fill.
5. Actual batch proportions.
6. Free moisture content of aggregate.
7. Quantity of water withheld.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting Work.

B. Verify excavation specified in Section 31 23 16 and trenching specified in Section 31 23 16.13 is complete.

C. Verify utility installation as specified is complete and tested before placing flowable fill.

D. Verify excavation is dry and dewatering system is operating.

## 3.02 PREPARATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Support and restrain utilities to prevent movement and flotation during installation of flowable fill.

C. Protect structures and utilities from damage caused by hydraulic pressure of flowable fill before fill hardens.

D. Protect utilities and foundation drains to prevent intrusion of flowable fill.

## 3.03 INSTALLATION - FILL, BEDDING, AND BACKFILL

A. Place flowable fill by chute, pumping or other methods approved by Engineer.

1. When required, place flowable fill under water using tremie procedure.
2. Do not place flowable fill through flowing water.

B. Place flowable fill in lifts to prevent lateral pressures from exceeding structural capacity of structures and utilities.

C. Place flowable fill evenly on both sides of utilities to maintain alignment.

D. Place flowable fill to elevations indicated on Drawings without vibration or other means of compaction.

## 3.04 INSTALLATION - FILLING ABANDONED UTILITIES

A. Verify pipes and conduits are not clogged and are sufficiently empty to permit gravity installation of flowable fill for entire length indicated to be filled.

B. Seal lower end of pipes and conduits by method to contain flowable fill and to vent trapped air caused by filling operations.

C. Place flowable fill using method to ensure there are no voids.

1. Fill pipes and conduits from high end.
2. Fill manholes, tanks, and other structures from grade level access points.

D. After filling pipes and conduits seal both ends.

3.05 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

3.06 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

B. Remove spilled and excess flowable fill from Project Site.

C. Restore facilities and Site areas damaged or contaminated by flowable fill installation to existing condition before installation.

END OF SECTION

# SECTION 312500 - EROSION AND SEDIMENTATION CONTROLS

## 1.1 SUMMARY

A. Section Includes:

1. Rock materials.
2. Concrete materials and reinforcement.
3. Block, stone, aggregate, and soil materials.
4. Planting materials.
5. Pipe materials.
6. Stabilized construction entrances.
7. Filter socks.
8. In-water siltation control devices.
9. On-land silt fence.
10. Erosion control blankets.
11. Baled hay.
12. Soil stabilization fabric.
13. Filtration geotextile.
14. Anchoring devices.
15. Accessories.

B. Related Requirements:

1. Section 031000 "Concrete Forming and Accessories."
2. Section 032000 "Concrete Reinforcing."
3. Section 033000 "Cast-in-Place Concrete" for concrete materials.
4. Section 310513 "Soils for Earthwork."
5. Section 310516 "Aggregates for Earthwork."
6. Section 311000 "Site Clearing."
7. Section 312316 "Excavation."
8. Section 312316.13 "Trenching."
9. Section 312323 "Fill."
10. Section 321313 "Concrete Paving."
11. Section 329113 "Soil Preparation."
12. Section 329119 "Landscape Grading."
13. Section 329219 "Seeding."
14. Section 330533.16 "HDPE Drainage Piping."

## 1.2 UNIT PRICES

A. Stabilized Construction Entrances:

1. Basis of Measurement: By linear foot.
2. Basis of Payment: Includes compaction of existing construction entrance substrate and placement of aggregate to depth required. Provide water supply to construction entrance for wheel wash.

B. Filter Socks:
   1. Basis of Measurement: By linear foot.
   2. Basis of Payment: Includes installation of complete siltation fence, including trenching, steel or wood post support elements, silt fence fabric, tie wires or clips, and erosion checks complete in place and accepted. Include silt fence removal as part of the basis of measurement.

C. In-Water Siltation Curtain:
   1. Basis of Measurement: By linear foot.
   2. Basis of Payment: Includes installation of complete in-water siltation curtain, including floatation elements, siltation curtain, tension cable, and ballast complete in place and accepted. Include curtain removal as part of the basis of measurement.

D. On-Land Silt Fence:
   1. Basis of Measurement: By linear foot.
   2. Basis of Payment: Includes installation of complete on-land silt fence, including trenching, installation of steel or wood post support elements, silt fence fabric, tie wires or clips, and erosion checks complete in place and accepted. Include fence removal as part of the basis of measurement.

E. Erosion Control Blanket:

   1. Basis of Measurement: By square yard.
   2. Basis of Payment: Includes installation of complete erosion control blankets, wires staples, clips, and erosion checks complete in place and accepted. Include silt fence removal as part of the basis of measurement.

F. Baled Hay:

   1. Basis of Measurement: By each unit.
   2. Basis of Payment: Includes installation of baled hay erosion checks and stacking in place, with wood posts complete in place and accepted. Include baled hay removal as part of the basis of measurement.

G. Soil Stabilization Fabric/Filtration Geotextile:

   1. Basis of Measurement: By square yard.
   2. Basis of Payment: Includes installation of complete soil stabilization fabric on poor subgrades and filtration geotextile under riprap complete in place and accepted.

H. Diversion Channel:

   1. Basis of Measurement: By linear foot.
   2. Basis of Payment: Includes excavating, windrowing, compacting, seeding, and mulching.

I. Rock Energy Dissipator:

   1. Basis of Measurement: By each unit.
   2. Basis of Payment: Includes cleaning, excavating, backfilling, placing embankment, placing geotextile fabric, placing rock, and required grouting.

J. Paved Energy Dissipator:

1. Basis of Measurement: By linear foot for nominal channel width of feet, slope length of feet, and dissipator length of feet.
2. Basis of Payment: Includes excavating, removing unsuitable material, backfilling, placing stones or blocks, paving, and jointing.

K. Rock Basin:

1. Basis of Measurement: By each unit.
2. Basis of Payment: Includes excavating, removing unsuitable material, backfilling, placing embankment, clearing, placing rock, and grouting.

L. Rock Barrier or Filter:

1. Basis of Measurement: By cubic yard.
2. Basis of Payment: Includes placing rock and coarse-aggregate filter blanket.

M. Sediment Pond:

1. Basis of Measurement: By each unit.
2. Basis of Payment: Includes clearing, excavating, piping, placing riser footing, constructing embankment and trench and rock basin, seeding, and mulching.

N. Sediment Trap:

1. Basis of Measurement: By each unit.
2. Basis of Payment: Includes clearing, excavating, forming embankment, placing aggregate or rock and geotextile fabric, seeding, and mulching.

O. Cleaning Sedimentation Structures:

1. Basis of Measurement: By cubic yard.
2. Basis of Payment: Includes removal, hauling, and disposal of sediment and other debris in system.

## 1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project Site.

B. Convene minimum one week prior to commencing Work of this Section.

## 1.4 SUBMITTALS

A. Product Data: Submit data on on-land silt fence, filter socks, and erosion control blanket.

B. Stormwater Pollution Prevention Plan (SWPPP): As specified in QUALITY ASSURANCE Article.

C. Copy of EPA NPDES Notice of Intent to Discharge submitted to the EPA as specified in QUALITY ASSURANCE Article.

D. Submit name and applicable experience of soil erosion and sediment control manager according to Section 1.5 F.

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

F. Test Reports: Indicate certified tests results for precast concrete at manufacturing facility, cast-in-place concrete in field, and granular backfill.

1.5

A. Source and Origin Certificates: Product certificates for the source and origin for fine- and coarse-aggregate materials and filtration and stabilization geotextile materials.

B. Regional Material Certificates: Product certificates for the source for regional fine- and coarse-aggregate materials, structural concrete, and riprap stone and distance from Project Site.

1.6 QUALITY ASSURANCE

A. Prepare and submit a Stormwater Pollution Prevention Plan (SWPPP) according to the U.S. Environmental Protection Agency (EPA) National Pollution Discharge Elimination System (NPDES) General Permit applicable to this Work, document number EPA 832-R-92-005, dated 1992 or most recent edition.

B. Prepare and submit the EPA NPDES Notice of Intent to Discharge to the applicable EPA office according to EPA regulations.

C. Perform Work according to requirements of Section 031000 "Concrete Forming and Accessories," Section 032000 "Concrete Reinforcing," Section 033000 "Cast-in-Place Concrete," [Section 310513 "Soils for Earthwork," [Section 310516 "Aggregates for Earthwork," [Section 311000 "Site Clearing," Section 312316 "Excavation," Section 312323 "Fill," Section 321313 "Concrete Paving," Section 329119 "Landscape Grading," Section 329113 "Soil Preparation," Section 329219 "Seeding

D. Perform Work according to NYSDOT standards.

E. Progress Schedule:

1. Clearly outline intended maintenance of traffic, locations where temporary and permanent soil erosion and sediment control measures will be installed, and such other information as required.
2. Provide special consideration to sensitive areas such as wetlands and waterways.
3. Incorporate appropriate staging and seasonal constraints to maximize the effectiveness of the soil erosion and sediment controls.

4. Indicate when Work is restricted in these sensitive areas as outlined in permits issued by regulatory agencies.

F. Soil Erosion and Sediment Control Manager:

1. Assign to the Project a supervisory-level employee to serve in the capacity of soil erosion and sediment control manager. This employee is required to be thoroughly experienced in all aspects of soil erosion and sediment control and construction. Submit the name and experience of this employee to the Clerk for approval at least 10 working days prior to commencing any Work on the Project.
2. Assigned manager will be responsible for the following:

a. Implement approved soil erosion and sediment control schedules and methods of operations.
b. Coordinate operations with the Architect/Engineer and oversee and supervise all aspects of soil erosion and sediment control Work for the Project.
c. Attend all soil erosion and sediment control meetings during the Contract.

## 1.7 FIELD CONDITIONS

A. Minimum Conditions:

1. Do not place grout when air temperature is below freezing.
2. Do not place concrete when base surface temperature is less than 40 degrees F or surface is wet or frozen.

# PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

A. Perform Work according to:

1. The State of NY Department of Transportation standards.
2. The Municipality of Johnson City Department of Public Works standards.

## 2.2 FILTER SOCKS

A. Provide filter socks consisting of a three-dimensional matrix of certified, composted organic material or other organic matter to create a filter medium. Fill the tubular mesh sock with organic filter material of wood chips or mulch that has been screened to remove fines, crushed stone, or gravel. Use crushed stone or gravel when the sock will be used on paved areas where the sock cannot be staked in place. Fill the sock with organic material by blowing the material into the tube with a special pneumatic blower truck or similar device. Hand filling with organic material is not an acceptable means to fill the tube as the material cannot be compacted in the sock.

B. Manufacturers:

1. Atlantic Screen & Mfg., Inc.
2. Filtrexx International/MKB Company.
3. L & M Supply; Core & Main LP.
4. Palcon, LLC.
5. The Cary Company.

C. Performance and Design Criteria:

1. Mesh Material Type: Multi-filament polypropylene (MFPP) photodegradable.
2. Uses: Standard sediment control applications.
3. Mesh Opening Size: 1/8 inch .
4. Available Diameters: 5 inches, 8 inches, 12 inches, 18 inches, 24 inches.
5. Functional Longevity/Project Duration: Up to five years.
6. Tensile Strength: MD - 670 lb. , TD - 423 lb.
7. Locally sourced filter media.
8. Mesh Color: Green or tan.

## 2.3 ON-LAND SILT FENCE

A. Provide on-land silt fence consisting of a woven fabric comprised of high-tenacity polypropylene yarns and a plastic net backing, square hardwood posts, and connection hardware or aluminum wire.

B. Performance and Design Criteria:

1. Grab Tensile Strength (Machine Direction): ASTM D4632/D4632M - 124 lb.
2. Grab Tensile Strength (Cross-Machine Direction): ASTM D4632/D4632M - 124 lb .
3. Grab Tensile Elongation: ASTM D4632/D4632M - 15 percent.
4. Mullen Burst Strength: ASTM D3786/D3786M - 300 psi.
5. Trapezoid Tear Strength: ASTM D4533/D4533M - 65 lb.
6. Permittivity: ASTM D4491/D4491M - 0.10 $sec^{-1}$.
7. Water Flow Rate: ASTM D4491/D4491M - 10 gpm/sq. ft.
8. Ultraviolet Stability: ASTM D4355/D4355M - 70 percent.
9. Length: 100 feet.
10. Width: 3 feet.
11. Post Length: 4 feet.
12. Post Spacing: 8.3 feet.

C. Provide prefabricated commercial silt fence; may be substituted for built-in-field fence.

## 2.4 EROSION CONTROL BLANKETS

A. Erosion Control Blankets: 100 percent agricultural straw fiber matrix, 0.5 lb./sq. yd., stitch bonded with degradable thread between two photodegradable polypropylene nettings.

B. Securement: Staples used to anchor erosion control blankets should be U-shaped, 11-gage or heavier steel wire, having a span width of 1 inch and a length of 6 inches or more from top to bottom after bending.

## 2.5 BALED HAY

A. Provide baled hay erosion checks consisting of new, firm, wire-bound, livestock feed-grade hay bales, employed at locations detailed on the Drawings or as required to perform erosion control. Provide No. 2 pine or hem fir stakes measuring a minimum of 2 inches by 2 inches wide by 48 inches long for staking and securement of hay bales.

## 2.6 SOIL STABILIZATION FABRIC

A. Provide soil stabilization fabric consisting of durable woven fabric, resistant to tearing, rot, mildew, and soil chemicals, composed wholly of polypropylene or a combination of polypropylene and other continuous-filament fibers. Provide pore openings permitting drainage.

B. Manufacturers:

1. Advanced Drainage Systems, Inc.
2. Contech Engineered Solutions LLC.
3. TenCate Geosynthetics.
4. US Fabrics Inc.

C. Performance and Design Criteria:

1. Weight: ASTM D5262 - [4 oz./sq. yd.
2. Grab Tensile Strength: ASTM D4632/D4632M - [200 lb.
3. Grab Tensile Elongation: ASTM D4632/D4632M - 15 percent.
4. Mullen Burst Strength: ASTM D3786/D3786M - [400 psi.
5. CBR Puncture: ASTM D6241 - [700 lb.
6. Trapezoid Tear Strength: ASTM D4533/D4533M - [75 lb.
7. Apparent Opening Size: ASTM D4751 - [40 U.S. sieve.
8. Permittivity: ASTM D4491/D4491M - 0.05 $sec^{-1}$.
9. Water Flow Rate: ASTM D4491/D4491M - [5 gpm/sq. ft.
10. Ultraviolet Stability: ASTM D4355/D4355M - 70 percent.
11. Length: [432 feet, 360 feet, 309 feet.
12. Width: [12.5 feet, 15 feet, 17.5 feet.

## 2.7 FILTRATION GEOTEXTILE

A. Provide woven filtration geotextile comprised of high-tenacity, monofilament, 100 percent polypropylene yarns, which resists ultraviolet and biological deterioration, rotting, and naturally encountered basics and acids. Place filtration geotextile on subgrade below riprap stone or as indicated.

B. Manufacturers:

1. Carthage Mills.
2. Hanes Geo.
3. TenCate Geosynthetics.
4. US Fabrics Inc.
5. Willacoochee Industrial Fabrics.

C. Performance and Design Criteria:

1. Grab Tensile Strength: ASTM D4632/D4632M - 425 by 350 lb.
2. Grab Tensile Elongation: ASTM D4632/D4632M - 21 percent.
3. Wide Width Tensile Strength: ASTM D4595 - 3,240 by 2,700 lb./ft.
4. CBR Puncture: ASTM D6241 - 1,340 lb.
5. Trapezoid Tear Strength: ASTM D4533/D4533M - 145 by 125 lb.
6. Apparent Opening Size: ASTM D4751 - 40 U.S. sieve.
7. Permittivity: ASTM D4491/D4491M - 0.96 $sec^{-1}$.
8. Permeability: ASTM D4491/D4491M - 0.046 cm/s.
9. Water Flow Rate: ASTM D4491/D4491M - 70 gpm/sq. ft.
10. Percent Open Area: CW-02215 - 6 percent.
11. Ultraviolet Stability: ASTM D4355/D4355M - 90 percent.
12. Length: 300 feet.
13. Width: 12.5 feet.

## 2.8 ANCHORING DEVICES

A. Staples: Must be No. 8 gage steel wire, bent U-shapes with throat width equal to 1 to 2 inches, and effective driving depth of 6 inches or as suggested by the manufacturer.

B. Sandbags: Must be of proper size to temporarily stabilize fabric; number and weight sufficient to withstand wind speeds of 50 mph.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

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

B. Verify compacted subgrade, granular base, stabilized soil is acceptable and ready to support devices and imposed loads.

C. Verify gradients and elevations of base or foundation for other Work are correct.

## 3.2 PROJECT REQUIREMENTS

A. The [**Contractor**] [**Project Manager**] [**Construction Manager**] is responsible for the timely installation and maintenance of all sedimentation control and dewatering devices necessary to prevent the movement of sediment from the construction Site to off-site areas or into wetlands or other drainage systems. Measures listed here, in addition to those shown on the Drawings, necessary to prevent the movement of sediment off-site are required to be installed, maintained, removed, and cleaned up at the expense of the [**Contractor**] [**Project Manager**] [**Construction Manager**]. No additional charges to the Owner will be considered.

## 3.3 ENTRANCES

A. Construct entrance with a minimum of 6 inches of coarse aggregate at all points of ingress and egress.

B. Width: Minimum 20 feet, increased as needed for typical construction vehicles.

C. Minimum Length: 50 feet where soils are coarse grained. 100 feet where soils are fine grained or clay/silt.

D. Install filter fabric below aggregate.

E. Maintain entrance throughout construction, adding more aggregate or increasing length as needed.

## 3.4 INSTALLATION OF FILTER SOCKS

A. Position filter socks as indicated and as necessary to prevent off-site movement of sediment produced by construction activities as directed by the Engineer.

1. Install erosion control measures around all existing catch basins within the Project limits and in the adjacent affected areas, or as determined by the Engineer in the field.

B. Install stakes through the middle of the sediment control on minimum 10-foot centers. Depth of staking must be 12 inches for sand or silt and 8 inches for clay soils.

C. Install filter socks, as indicated, and stake as required.

D. Furnish, place, and maintain filter socks as specified and as shown. Remove upon completion of all Work.

## 3.5 INSTALLATION OF ON-LAND SILT FENCE

A. Position sediment fences as indicated on the Drawings and to prevent off-site movement of sediment produced by construction activities as directed by Engineer. Provide areas beyond limits of silt fence undisturbed or stabilized.

B. Dig trench approximately 6 inches wide and 6 inches deep along proposed fence lines.

C. Drive stakes maximum 10 feet on center at back edge of trenches. Drive stakes minimum 2 feet into ground.

D. Hang filter fabric on posts carrying to bottom of trench with about 4 inches of fabric laid across bottom of trench. Stretch fabric taut along fence length and maintain secure both ways.

E. Backfill trench with excavated material and tamp.

F. Install prefabricated silt fence according to manufacturer's instructions.

## 3.6 INSTALLATION OF BALED HAY

A. Install baled hay in location as shown and as directed by the Engineer.

B. Install by anchoring bales butted together to existing ground with at least two stakes per bale. Replace deteriorated bales. Remove and dispose of bales following the successful growth of vegetation in the areas disturbed by construction. The removal of bales will be subject to approval of Engineer. On embankment areas and on flat areas adjacent to wetland areas, install the bales continuously between the construction Site and the wetland area as indicated.

C. Install baled hay around all catch basins to be protected as identified.

## 3.7 INSTALLATION OF ACCESSORIES

A. Installation of Anti-seep Collar:

1. Apply tar or mastic to bottom half of collar and lay pipe on collar.
2. Apply mastic to top half of collar and set in place, lining up colored stripes.
3. Bolt the two halves together and install metal bands. Tighten bolts and bands.
4. Apply mastic as needed to provide a positive seal.
5. Backfill and hand tamp.

## 3.8 STABILIZATION OF SITE

A. Incorporate erosion control devices indicated into the Project at the earliest practicable time.

B. Construct, stabilize, and activate erosion controls before Site disturbance within tributary areas of those controls.

C. Stockpile and waste pile heights must not exceed 35 feet. Slope stockpile sides at 2:1 or flatter.

D. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 20 days.

1. During non-germinating periods, apply mulch at recommended rates.
2. Stabilize disturbed areas that are not at finished grade and which will be disturbed within one year according to Section 329113 "Soil Preparation" and Section 329219 "Seeding" at 50 percent of permanent application rate with no topsoil.

3. Stabilize disturbed areas that either are at finished grade or will not be disturbed within one year according to Section 329113 "Soil Preparation" and Section 329219 "Seeding" permanent seeding specifications.

E. Stabilize diversion channels, sediment traps, and stockpiles immediately.

F. Installation of Diversion Channel:

1. Windrow excavated material on low side of channel.
2. Compact to 95 percent maximum density.
3. On the entire channel area, apply soil supplements and sow seed as specified in Section 329113 "Soil Preparation" and Section 329219 "Seeding."
4. Mulch seeded areas with hay as specified in Section 329113 "Soil Preparation" and Section 329219 "Seeding."

G. Installation of Sediment Trap:

1. Clear Site as specified in Section 311000 "Site Clearing."
2. Construct trap by excavating and forming embankments as specified in Section 312316 "Excavation" and Section 312323 "Fill."
3. Place coarse aggregate or rock at outlet as indicated on Drawings.
4. Place geotextile fabric as specified for rock energy dissipator.
5. When required, obtain borrow excavation for formation of embankment as specified in Section 312316 "Excavation."
6. On entire sediment trap area, apply soil supplements and sow seed as specified in Section 329113 "Soil Preparation" and Section 329219 "Seeding."
7. Mulch seeded areas with hay as specified in Section 329113 "Soil Preparation" and Section 329219 "Seeding."
8. Install Work according to NYSDEC standards.

## 3.9 FIELD QUALITY CONTROL

A. Testing Agency: **Owner will engage** a qualified testing agency to perform tests and inspections.

B. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.

C. Field test concrete according to Section **033000 "Cast-in-Place Concrete"**.

D. Compaction Testing, Option 1: As specified in Section **312323 "Fill"**.

E. Compaction Testing, Option 2: According to ASTM D1557, ASTM D698, AASHTO T 180, ASTM D6938 and ASTM D3017.

F. When tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

G. Frequency of Compaction Testing: One for each lift.

H. Prepare test and inspection reports.

3.10 CLEANING

A. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device, remove and dispose of sediment.

B. Do not damage structure or device during cleaning operations.

C. Do not permit sediment to erode into construction or Site areas or natural waterways.

D. Clean channels when depth of sediment reaches approximately one-half channel depth.

3.11 PROTECTION

A. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit construction traffic over paving for 7 [seven] days minimum after finishing.

C. Protect paving from elements, flowing water, or other disturbance until curing is complete.

END OF SECTION 312500

SECTION 32 05 13

SOILS FOR EXTERIOR IMPROVEMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Subsoil materials.
2. Topsoil materials.

B. Related Sections:

1. Section 31 05 13 - Soils for Earthwork.
2. Section 31 22 13 - Rough Grading.
3. Section 31 23 16.13 - Trenching.
4. Section 31 23 23 - Fill.
5. Section 32 05 16 - Aggregates for Exterior Improvements.
6. Section 32 91 19 - Landscape Grading.
7. Section 32 92 19 - Seeding.
8. Section 32 92 23 - Sodding.

1.02 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:

1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3).
2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3. (2,700 kN-m/m3).
3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

1.03 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Samples: Submit, in air-tight containers, 10 lb sample of each type of fill to testing laboratory.

C. Materials Source: Submit name of imported materials source.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

A. Furnish each subsoil and topsoil material from single source throughout the Work.

B. Maintain one copy on site.

PART 2 - PRODUCTS

2.01 SUBSOIL MATERIALS

A. Subsoil Type S1:

1. An excavated and re-used material or imported Select borrow free of lumps and debris conforming to New York State Department of Transportation Standard Specifications for Construction Materials Item 304-2.02 Type 4.
2. Material shall meet the following gradation as determined by ASTM-C136 as follows:

    a. Percent Passing by Weight Per Sieve Size

        1) 2 Inch 100.
        2) 1/4 Inch 30 to 65.
        3) No. 40 5 to 40.
        4) No. 200 0 to 10.

3. Conforming to ASTM D2487 Group Symbol CL.
4. Where Architect / Engineer elects to test for this requirement, particles shall not have a loss, after four (4) cycles of the Magnesium Sulfate Soundness Test in accordance with ASTM Designation: C 88 (latest issue), exceeding 20 percent by weight; and the particles passing the No. 40 sieve shall have a Maximum Plasticity Index of 5.0.

B. Subsoil Type S2:

1. An excavated and re-used material or imported Select borrow free of lumps and debris.
2. Material shall consist solely of a sound, hard, durable stone, run-of-bank gravel, sand, blast furnace slag or stone, or other acceptable granular material meeting the following gradation as determined by ASTM-C136 as follows:

    a. Percent Passing by Weight Per Sieve Size

        1) 3 inch 100
        2) 1/4 inch 25 to 90.

3) No. 40 5 to 40.
4) No. 200 0 to 10.

C. Subsoil Type S3:

1. An excavated and re-used material or imported Ordinary borrow free of lumps and debris.
2. Material shall consist solely of a sound, hard, durable stone, run-of-bank gravel, sand, blast furnace slag or stone, or other acceptable granular material meeting the following gradation as determined by ASTM-C136 as follows:

a. Percent Passing by Weight Per Sieve Size

1) 3 Inch 100.
2) No. 40 5 to 40.
3) No. 200 0 to 35.

3. Conforming to ASTM D2487 Group Symbol CL.
4. Where Architect / Engineer elects to test for this requirement, particles shall not have a loss, after four (4) cycles of the Magnesium Sulfate Soundness Test in accordance with ASTM Designation: C 88 (latest issue), exceeding 20 percent by weight; and the particles passing the No. 40 sieve shall have a Maximum Plasticity Index of 5.0.

D. Subsoil Type S4:

1. An excavated and re-used material or imported borrow shall be crushed limestone.
2. Material shall consist solely of an approved stone which is the product of crushing limestone meeting the following gradation as determined by ASTM-C136 as follows:

a. Percent Passing by Weight Per Sieve Size

1) 2 Inch 100.
2) 3/4 Inch 75 to 90.
3) 1/4 Inch 25 to 60.
4) No. 40 5 to 40.
5) No. 200 0 to 10.

3. Conforming to ASTM D2487 Group Symbol CL.
4. Where Architect / Engineer elects to test for this requirement, particles shall not have a loss, after four (4) cycles of the Magnesium Sulfate Soundness Test in accordance with ASTM Designation: C 88 (latest issue), exceeding 20 percent by weight; and the particles passing the No. 40 sieve shall have a Maximum Plasticity Index of 5.0.

E. Subsoil Type S5:

1. An excavated and re-used material or imported borrow conforming to New York State Department of Transportation Standard Specifications for Construction Materials Item 304-2.02 Type 2.
2. Material shall consist solely of approved blast furnace slag or stone which is the product of crushing ledge rock meeting the following gradation as determined by ASTM-C136 as follows:

a. Percent Passing by Weight Per Sieve Size

1) 2 Inch 100.

2) 1/4 Inch 25 to 60.
3) No. 40 5 to 40.
4) No. 200 0 to 10.

3. Conforming to ASTM D2487 Group Symbol CL.
4. Where Architect / Engineer elects to test for this requirement, particles shall not have a loss, after four (4) cycles of the Magnesium Sulfate Soundness Test in accordance with ASTM Designation: C 88 (latest issue), exceeding 20 percent by weight; and the particles passing the No. 40 sieve shall have a Maximum Plasticity Index of 5.0

2.02 TOPSOIL MATERIALS

A. Topsoil Type S6.

1. An excavated and re-used onsite material or imported borrow.
2. Topsoil may be naturally occurring or may be manufactured and shall be free from refuse, material toxic or otherwise deleterious to plant growth, subsoil, woody vegetation and stumps, roots, brush, stones, clay lumps or similar objects. Manufactured topsoil shall consist of a mineral component and amendments to meet the specified organic content, pH and other requirements. Sod and herbaceous growth such as grass and weeds need not be removed but shall be thoroughly broken up and mixed with the soil during handling or manufacturing operations
3. Sandy loam conforming to ASTM D2487 Group Symbol OH.
4. Reasonably free of roots, rocks larger than 1/2-inch, subsoil, debris, large weeds, and foreign matter.
5. Screening: Single screened or rock picked and meet the following gradation:

a. Percent Passing by Weight Per Sieve Size

1) 3/4 Inch 100.
2) 1/4 Inch 85 to 100.
3) No. 200 20 to 80 (of the ¼ inch Sieve).

6. Acidity range (pH) of 5.5 to 7.6 as determined by ASTM D-4972.
7. Containing minimum of 5 percent and maximum of 10 percent inorganic matter as determined by ASTM D-2974.
8. If organic amendments are needed to obtain the specified organic matter content of the onsite topsoil, the organic matter source may be a peat or compost material. The peat shall be a Canadian sphagnum peat having an ash content not exceeding 15%, as determined by ASTM D-2974. Composts may be used, provided that the material has been composted in an in-vessel system and has an ash content not exceeding 40%.
9. Excess topsoil will be the property of OWNER and shall be stockpiled where indicated by OWNER.

10. Limit decaying matter to 10 percent of total content by volume.

B. Topsoil Type S7:

1. An imported topsoil conforming to New York State Department of Transportation Standard Specifications for Construction Materials Section 713-01 Topsoil.
2. Topsoil may be naturally occurring or may be manufactured and shall be free from refuse, material toxic or otherwise deleterious to plant growth, subsoil, woody vegetation and stumps, roots, brush, stones, clay lumps or similar objects. Manufactured topsoil shall consist of a mineral component and amendments to meet the specified organic content, pH and other requirements. Sod and herbaceous growth such as grass and weeds need not be removed but shall be thoroughly broken up and mixed with the soil during handling or manufacturing operations.
3. Topsoil shall be single screened, or rock picked and meet the following gradation:

    a. Percent Passing by Weight Per Sieve Size
        1) 2 inch 100.
        2) 1 inch 85 to 100.
        3) 1/4 inch 65 to 100.
        4) No. 200 20 to 80.

4. Friable loam conforming to ASTM D2487 Group Symbol OH.
5. Reasonably free of roots, rocks larger than 1inch, subsoil, debris, large weeds, and foreign matter.
6. Acidity range (pH) of 5.5 to 7.6 as determined by ASTM D-4972.
7. Containing minimum of 2 percent and maximum of 20 percent inorganic matter as determined by ASTM D-2974.

C. Topsoil Type S8:

1. Excavated and reused onsite material.
2. Free of roots, rocks larger than 3/4-inch, subsoil, debris, large weeds and foreign matter.
3. Screening: Double screened.
4. Conforming to ASTM D2487 Group Symbol OH.
5. Acidity range (pH) of 5.5 to 7.6 as determined by ASTM D-4972.
6. Containing minimum of 2 percent and maximum of 20 percent inorganic matter as determined by ASTM D-2974.
7. If organic amendments are needed to obtain the specified organic matter content of the topsoil, the organic matter source may be a peat or compost material. The peat shall be a Canadian sphagnum peat having an ash content not exceeding 15%, as determined by ASTM D-2974. Composts may be used, provided that the material has been composted in an in-vessel system and has an ash content not exceeding 40%.
8. Excess topsoil will be the property of OWNER and shall be stockpiled where indicated by OWNER.

2.03 SOURCE QUALITY CONTROL

A. Section 014000 - Quality Requirements: Testing and Inspection Services Testing and analysis of soil material.

B. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D1557.

C. Testing and Analysis of Topsoil Material: Analyze to determine percentage of nitrogen, phosphorus, potash, soluble salt, organic matter, and pH.

D. When tests indicate materials do not meet specified requirements, change material and retest.

E. Furnish materials of each type from same source throughout the Work.

PART 3 - EXECUTION

3.01 EXCAVATION

A. Excavate subsoil and topsoil from areas designated. Strip topsoil to full depth of topsoil in designated areas.

B. Stockpile excavated material meeting requirements for subsoil materials and topsoil materials.

C. Remove excess excavated materials not intended for reuse, from site.

D. Remove excavated materials not meeting requirements for subsoil materials and topsoil materials from site.

3.02 STOCKPILING

A. Stockpile materials on site at locations designated by Architect/Engineer.

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

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Stockpile topsoil 8 feet high maximum.

E. Prevent intermixing of soil types or contamination.

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

G. Stockpile unsuitable materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.03 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 32 05 16

AGGREGATES FOR EXTERIOR IMPROVEMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Coarse aggregate materials.
2. Fine aggregate materials.

B. Related Sections:

1. Section 31 05 16 - Aggregates for Earthwork.
2. Section 31 22 13 - Rough Grading.
3. Section 31 23 16.13 - Trenching.
4. Section 31 23 23 - Fill.
5. Section 32 05 13 - Soils for Exterior Improvements: Fill and grading materials.
6. Section 32 11 23 - Aggregate Base Courses.
7. Section 32 91 19 - Landscape Grading.
8. Section 33 42 00 - Stormwater Conveyance.

1.02 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO M147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses.
2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:

1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D448 - Standard Classification for Sizes of Aggregate for Road and Bridge Construction
3. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3).
4. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3).
5. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
6. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.03 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Samples: Submit, in air-tight containers, 10 lb sample of each type of fill to testing laboratory.

C. Materials Source: Submit name of imported materials suppliers.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

A. Maintain one copy of each document on site.

PART 2 - PRODUCTS

2.01 COARSE AGGREGATE MATERIALS

A. Coarse Aggregate Type A1 (Gravel): Angular crushed natural washed stone; free of shale, clay, friable material and debris; graded in accordance with ASTM C136,; within the following limits, based on ASTM D448.

1. Percent Passing per Sieve Size:

a. 1 1/2 Inches 100.
b. 1 Inch 90 to 100.
c. 1/2 Inches 0 to 15.
d. No. 200 0 to 1.

B. Coarse Aggregate Type A2 (Gravel): Angular crushed natural washed stone; free of shale, clay, friable material and debris; graded in accordance with ASTM C136,; within the following limits, based on ASTM D448:

1. Percent Passing per Sieve Size:

a. 1 Inch 100.

C. Coarse Aggregate Type A3 (Gravel): Angular crushed natural washed stone; free of shale, clay, friable material and debris; graded in accordance with ASTM C136,; within the following limits, based on ASTM D448:

1. Percent Passing per Sieve Size:

a. 1/2 Inch: 100.
b. 1/4 Inch: 90 to 100.
c. 1/8 Inch 0 to 15.
d. No. 200: 0 to 1.

D. Aggregate Type A4 (Pea Gravel): Natural stone; washed, free of clay, shale, organic matter; graded in accordance with ASTM C136; to the following limits:

1. Minimum Size: 1/8 inch.
2. Maximum Size: 3/8 inch.

2.02 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing and inspection services.

B. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D1557.

C. When tests indicate materials do not meet specified requirements, change material and retest.

PART 3 - EXECUTION

3.01 STOCKPILING

A. Stockpile materials on site at locations designated by Architect/Engineer.

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. Stockpile unsuitable materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.02 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 32 11 23

AGGREGATE BASE COURSES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Aggregate subbase.
2. Aggregate base course.

B. Related Sections:

1. Section 31 22 13 - Rough Grading: Preparation of site for base course.
2. Section 31 23 16.13 - Trenching: Compacted fill under base course.
3. Section 31 23 23 - Fill: Compacted fill under base course.
4. Section 32 05 16 - Aggregates for Exterior Improvements.
5. Section 32 12 16 - Asphalt Paving: Binder and finish asphalt courses.
6. Section 32 13 13 - Concrete Paving: Finish concrete surface course.
7. Section 32 91 19 - Landscape Grading: Topsoil fill at areas adjacent to aggregate base course.
8. Section 33 05 61 - Concrete Manholes: Manholes and Drains including frames.

1.02 REFERENCES

A. ASTM International:

1. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
2. ASTM D2940 - Standard Specification for Graded Aggregate Material For Bases or Subbases for Highways or Airports.
3. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.03 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:

1. Submit data for geotextile fabric and herbicide.

C. Samples: Submit, in air-tight containers, 10 lb. sample of each type of aggregate fill to testing laboratory.

D. Materials Source: Submit name of aggregate materials suppliers.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

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

B. Maintain one copy of each document on site.

PART 2 - PRODUCTS

2.01 AGGREGATE MATERIALS

A. Subbase Aggregate: ASTM D2940; graded type.

1. Percent Passing per Sieve Size:

a. 2 Inches: 100.
b. No. 4: 30 to 60.
c. No. 200: Zero to 12.

2.02 AGGREGATE MATERIALS

A. Coarse Aggregate: Fill Type as specified in Section 320516.

B. Fine Aggregate: Fill Type as specified in Section 320516.

2.03 ACCESSORIES

A. Geotextile Fabric: as specified in Section 321216.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting Work.

B. Verify compacted substrate is dry and ready to support paving and imposed loads.

1. Proof roll substrate with a 10-wheel dump truck loaded with 20 tons of material in minimum two perpendicular passes to identify soft spots.
2. Remove soft substrate and replace with compacted fill as specified in Section 31 23 23.

C. Verify substrate has been inspected, gradients and elevations are correct.

## 3.02 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place fill on soft, muddy, or frozen surfaces.

## 3.03 AGGREGATE PLACEMENT

A. Install geotextile fabric over subgrade according to manufacturer's instructions.

1. Lap ends and edges minimum 6 inches.
2. Anchor fabric to subgrade when required to prevent displacement until aggregate is installed.

B. Spread aggregate over prepared substrate to total compacted thickness indicated on Drawings.

C. Roller compact aggregate to 95 percent maximum density.

D. Level and contour surfaces to elevations, profiles, and gradients indicated.

E. Add small quantities of fine aggregate to coarse aggregate when required to assist compaction.

F. Maintain optimum moisture content of fill materials to attain specified compaction density.

G. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

## 3.04 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation From Flat Surface: 1/4 inch measured with 10 foot straight edge.

C. Maximum Variation From Thickness: 1/4 inch.

D. Maximum Variation From Elevation: 1/2 inch.

## 3.05 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements 017000 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Compaction testing will be performed according to ASTM D1556 ASTM D1557 ASTM D698 ASTM D2167 ASTM D2922 ASTM D3017.

C. When tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

D. Frequency of Tests: One test for every 50 cubic yards of compacted aggregate.

END OF SECTION

SECTION 32 12 16

ASPHALT PAVING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Asphalt materials.
2. Aggregate materials.
3. Aggregate subbase.
4. Asphalt paving base course, binder course, and wearing course.
5. Asphalt paving overlay for existing paving.

B. Related Requirement:

1. Section 31 22 13 - Rough Grading: Preparation of site for paving and base.
2. Section 31 23 23 - Fill: Compacted subbase for paving.
3. Section 32 01 16 - Flexible Paving Rehabilitation.
4. Section 32 05 16 - Aggregates for Exterior Improvements: Product requirements for aggregate for placement by this section.
5. Section 32 11 23 - Aggregate Base Courses: Compacted subbase for paving.
6. Section 32 17 23 - Pavement Markings: Painted pavement markings, lines, and legends.

1.02 REFERENCE STANDARDS

A. Asphalt Institute:

1. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot- Mix Types.
2. AI MS-19 - Basic Asphalt Emulsion Manual.

B. ASTM International:

1. ASTM D242 - Standard Specification for Mineral Filler For Bituminous Paving Mixtures.
2. ASTM D692 - Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures.
3. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.
4. ASTM D977 - Standard Specification for Emulsified Asphalt.
5. ASTM D1073 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.
6. ASTM D2027 - Standard Specification for Cutback Asphalt (Medium-Curing Type).
7. ASTM D2397 - Standard Specification for Cationic Emulsified Asphalt.
8. ASTM D2726 - Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.

9. ASTM D2950 - Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
10. ASTM D3515 - Standard Specification for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
11. ASTM D3549 - Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.
12. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

1.03 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:

1. Submit product information for asphalt and aggregate materials.
2. Submit mix design with laboratory test results supporting design.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

A. Mixing Plant: Certified by of NYS DOT.

B. Obtain materials from same source throughout.

C. Perform Work in accordance with of NYS DOT standard.

D. Maintain one copy of each document on site.

1.05 QUALIFICATIONS

A. Installer: Company specializing in performing work of this section with minimum three years documented experience approved by manufacturer.

1.06 AMBIENT CONDITIONS

A. Section 01 50 00 - Temporary Facilities and Controls: Ambient conditions control facilities for product storage and installation.

B. Do not place asphalt mixture when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 - PRODUCTS

2.01 ASPHALT PAVING

A. Performance / Design Criteria:

1. Paving: Design for parking light duty commercial vehicles.

B. Asphalt Materials:

1. Asphalt Binder Cement: In accordance with NYS DOT standards.
2. Primer: ASTM D2027, MC-30 MC-70 MC-250; medium curing, cutback asphalt. In accordance with of NYS DOT standards.
3. Tack Coat: In accordance with NYS DOT standards.
4. Reclaimed Asphalt Pavement (RAP): Processed material obtained by milling or full depth removal of existing asphalt paving.
5. Oil: In accordance with NYS DOT standards.

C. Aggregate Materials:

1. Coarse Aggregate: In accordance with NYS DOT standards.

2. Fine Aggregate: In accordance with NYS DOT standards.

2.02 MIXES

A. Use dry material to avoid foaming. Mix uniformly.

B. Asphalt Paving Mixtures: Designed in accordance with NYS DOT standards.

1. Base Course: Type 1.
2. Binder Course: Type 3.
3. Wearing Course: Type 7F.

2.03 ACCESSORIES

A. Geotextile Fabric: AASHTO M288; non-woven, polypropylene.

B. Sealant: ASTM D6690, hot applied type.

2.04 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Submit proposed mix design of each class of mix for review prior to beginning of Work.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify utilities indicated under paving are installed with excavations and trenches backfilled and compacted.

C. Verify compacted subgrade and subbase is dry and ready to support paving and imposed loads.

1. Proof roll subbase with minimum two perpendicular passes to identify soft spots.
2. Remove soft subbase and replace with compacted fill as specified in Section 31 23 23.

D. Verify gradients and elevations of base are correct.

E. Verify gutter drainage grilles and frames and manhole frames are installed in correct position and elevation.

3.02 PREPARATION

A. Prepare subbase in accordance with NYS DOT standards.

3.03 DEMOLITION

A. Saw cut and notch existing paving as indicted on Drawings.

B. Clean existing paving to remove foreign material, excess joint sealant and crack filler from paving surface.

C. Repair surface defects in existing paving to provide uniform surface to receive new paving.

3.04 INSTALLATION

A. Subbase:

1. Aggregate Subbase: Install as specified in Section 32 11 23.

B. Tack Coat:

1. Apply tack coat in accordance with NYS DOT standards.

C. Single Course Asphalt Paving:

1. Install Work in accordance with NYS DOT standards.
2. Place asphalt within 24 hours of applying primer or tack coat.

3. Place asphalt wearing course to thickness indicated on Drawings.
4. Compact paving by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
5. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

D. Double Course Asphalt Paving:

1. Place asphalt binder course within 24 hours of applying primer or tack coat.
2. Place binder course to thickness indicated on Drawings.
3. Place wearing course within 24 hours of placing and compacting binder course. When binder course is placed more than 24 hours before placing wearing course, clean surface and apply tack coat before placing wearing course.
4. Place wearing course to thickness indicated on Drawings.
5. Compact each course by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
6. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

E. Multiple Course Asphalt Paving:

1. Place asphalt base course to thickness indicated on drawings.
2. Place asphalt binder course within 24 hours of applying primer or tack coat, if required.
3. Place binder course to thickness indicated on Drawings.
4. Place wearing course within 24 hours of placing and compacting binder course. When binder course is placed more than 24 hours before placing wearing course, clean surface and apply tack coat before placing wearing course.
5. Place wearing course to thickness indicated on Drawings.
6. Compact each course by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
7. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

## 3.05 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

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

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

D. Variation from Indicated Elevation: Within 1/4 inch.

## 3.06 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

C. Asphalt Paving Density: ASTM D2950 nuclear method; test one location for every 1000 square yards compacted paving.

3.07 PROTECTION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Immediately after placement, protect paving from mechanical injury for four hours or until surface temperature is less than 140 degrees F.

END OF SECTION

SECTION 32 13 13

CONCRETE PAVING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Aggregate subbase base course.
2. Concrete paving for:

a. Concrete sidewalks.
b. Concrete stair steps.
c. Concrete integral curbs and gutters.
d. Concrete median barriers.
e. Concrete parking areas and roads.

B. Related Requirements:

1. Section 07 90 00 - Joint Protection: Sealant for joints.
2. Section 09 90 00 - Painting and Coating: Pavement Markings.
3. Section 31 22 13 - Rough Grading: Preparation of site for paving and base.
4. Section 31 23 23 - Fill: Compacted subbase for paving.
5. Section 321123 - Aggregate Base Courses: base course.
6. Section 32 12 16 - Asphalt Paving.
7. Section 32 91 19 - Landscape Grading: Preparation of subsoil at pavement perimeter.

1.02 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:

1. AASHTO M324 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

B. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete.
2. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

C. ASTM International:

1. ASTM A185/A185M - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.

2. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
3. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
4. ASTM A775/A775M - S Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
5. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
6. ASTM A934/A934M - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
7. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
8. ASTM C33 - Standard Specification for Concrete Aggregates.
9. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
10. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
11. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
12. ASTM C150 - Standard Specification for Portland Cement.
13. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
14. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
15. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
16. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
17. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
18. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
19. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
20. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
21. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

1.03 PRE-INSTALLATION MEETINGS

A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.04 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:

1. Submit data on concrete materials, joint filler, admixtures and curing compounds.

C. Design Data:

1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:

    a. Hot and cold weather concrete work.

2. Identify mix ingredients and proportions, including admixtures.
3. Identify chloride content of admixtures and whether or not chloride was added during manufacture.

1.05 QUALITY ASSURANCE

A. Perform Work according to ACI 301.

B. Obtain cementitious materials from same source throughout.

C. Maintain one copy of each document on site.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum three years documented experience [approved by manufacturer].

1.07 AMBIENT CONDITIONS

A. Section 01 50 00 - Temporary Facilities and Controls: Ambient conditions control facilities for product storage and installation.

B. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 - PRODUCTS

2.01 AGGREGATE SUBBASE

A. Aggregate Subbase: As specified in Section 32 11 23.

2.02 CONCRETE PAVING

A. Performance / Design Criteria:

1. Paving: Design for parking light duty commercial vehicles.

B. Form Materials:

1. Form Materials: Conform to ACI 301.
2. Joint Filler: ASTM D1751; Asphalt impregnated fiberboard or felt, 1/4 inch thick.

C. Reinforcement:

1. Reinforcing Steel and Wire Fabric: Type specified in Section 032000.
2. Welded Plain Wire Fabric: ASTM A185/A185M; in flat sheets or coiled rolls; unfinished.
3. Dowels: ASTM A615/A615M; 60 ksi yield strength, plain steel bars; cut to length indicated on Drawings, square ends with burrs removed; unfinished.
4. Tie Wire: Minimum 16 gage annealed type.
5. Epoxy Coating Patching Material: Type as recommended by coating manufacturer.

D. Concrete Materials:

1. Concrete Materials: As specified in Section 03 30 00.
2. Fine and Coarse Aggregates: ASTM C33, Class 4S.

    a. Coarse Aggregate Maximum Size: 3/4 inches.

3. Concrete Reinforcing Fibers: ASTM C1116, high strength industrial-grade fibers specifically engineered for secondary reinforcement of concrete. Tensile strength 130 ksi; toughness 15 ksi; 3/4-inch-long fibers, 34 million/lb fiber count.
4. Water: ASTM C94/C94M; potable, without deleterious amounts of chloride ions.
5. Air Entrainment: ASTM C260.
6. Chemical Admixture: ASTM C494/C494M.
7. Curing and Sealing Compound: Sonneborn Kure 1315.

## 2.03 MIXES

A. Concrete Mix - By Prescriptive Criteria:

1. Mix and deliver concrete according to ASTM C94/C94M, Option B.
2. Provide concrete to the following mix design:

    a. Compressive Strength:

        1) 28-day: 4500 psi

    b. Maximum Water/Cement Ratio: .45 by weight (mass).
    c. Aggregate Size:

        1) Maximum: 3/4 inch

    d. Slump: 3 inches plus or minus 1 inch
    e. Air Entrainment: 6 percent +/- 1.5%.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify compacted subgrade and subbase is dry and ready to support paving and imposed loads.

1. Proof roll subbase in minimum two perpendicular passes to identify soft spots.
2. Remove soft subbase and replace with compacted fill as specified in Section 31 23 23.

C. Verify gradients and elevations of base are correct.

3.02 PREPARATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Moisten substrate to minimize absorption of water from fresh concrete.

C. Coat surfaces of manhole and catch basin frames with oil to prevent bond with concrete paving.

D. Notify Architect/Engineer minimum 24 hours prior to commencement of concreting operations.

3.03 INSTALLATION

A. Subbase:

1. Aggregate Subbase: Install as specified in Section 32 11 23.

B. Forms:

1. Place and secure forms and screeds to correct location, dimension, profile, and gradient.
2. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Reinforcement:

1. Place reinforcing as indicated on Drawings.
2. Interrupt reinforcing at contraction joints.
3. Place dowels and reinforcing to achieve paving and curb alignment as detailed.
4. Provide doweled joints at 6 inch spacing at transverse joints with one end of dowel set in capped sleeve to allow longitudinal movement.
5. Repair damaged epoxy coating to match shop finish.

D. Placing Concrete:

1. Place concrete as specified in Section 03 30 00.

E. Joints

1. Place expansion joints at 24-foot intervals. Align curb, gutter, and sidewalk joints.

2. Place joint filler between paving components and building or other appurtenances. Recess top of filler 1/4 inch for sealant installation.
3. Provide scored sawn joints at 6 feet intervals between sidewalks and curbs,
4. Provide keyed joints as indicated.
5. Saw cut contraction joints 3/16 inch wide at an optimum time after finishing. Cut 1/3 into depth of slab.
6. Seal joints as indicated on Drawings according to Section 07 90 00.

F. Finishing:

1. Sidewalk Paving: Light broom and trowel joint edges.
2. Median Barrier: Light broom, and trowel joint edges.
3. Curbs and Gutters: Wood float.
4. Direction of Texturing: Parallel to paving direction.
5. Place curing compound sealer on exposed concrete surfaces immediately after finishing.

G. Curing and Protection

1. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
2. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

## 3.04 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.

C. Maximum Variation From True Position: 1/4 inch.

## 3.05 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting, testing.

B. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

C. Perform field inspection and testing according to ASTM C94/C94M.

D. Inspect reinforcing placement for size, spacing, location, support.

E. Testing firm will take cylinders and perform slump and air entrainment tests according to ACI 301.

F. Strength Test Samples:

1. Sampling Procedures: ASTM C172.
2. Cylinder Molding and Curing Procedures: ASTM C31/C31M, cylinder specimens, standard cured.
3. Sample concrete and make one set of four cylinders for every 25 cu yds or less of each class of concrete placed each day and for every 5,000 sf of surface area paving.
4. Make one additional cylinder during cold weather concreting, and field cure.

G. Field Testing:

1. Slump Test Method: ASTM C143/C143M.
2. Air Content Test Method: ASTM C173/C173M ASTM C231.
3. Temperature Test Method: ASTM C1064/C1064M.
4. Measure slump and temperature for each compressive strength concrete sample.
5. Measure air content in air entrained concrete for each compressive strength concrete sample.

H. Cylinder Compressive Strength Testing:

1. Test Method: ASTM C39/C39M.
2. Test one cylinder at 7 days.
3. Test two cylinders at 28 days.
4. Retain one cylinder for 56 days for testing when requested by Architect/Engineer.
5. Dispose remaining cylinders when testing is not required.

I. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

## 3.06 PROTECTION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.

C. Do not permit pedestrian or vehicular traffic over paving for 7 days minimum after finishing.

END OF SECTION

SECTION 32 16 23

SIDEWALKS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Concrete paving for sidewalks.

B. Related Requirements:

1. Section 32 17 23. - Pavement Markings.
2. Section 31 22 13 - Rough Grading: Preparation of Site for paving and base grade.
3. Section 31 23 23 - Fill: Compacted subgrade for paving.
4. Section 32 11 23 - Aggregate Base Courses: base course.
5. Section 32 91 19 - Landscape Grading: Preparation of subsoil at pavement perimeter.

1.02 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Section 01 20 00 - Price and Payment Procedures: Contract Sum/Price modification procedures.

B. Sidewalks:

1. Basis of Measurement: By square yard.
2. Basis of Payment: Includes subbase, forms, reinforcing, concrete, accessories, placing, finishing, curing, and testing.

1.03 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:

1. AASHTO M182 - Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats.

B. American Concrete Institute:

1. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

C. ASTM International:

1. ASTM A184/A184M - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement.

2. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
3. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
4. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
5. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
6. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
7. ASTM A934/A934M - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
8. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
9. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
10. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
11. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
12. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
13. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.
14. ASTM C150/C150M - Standard Specification for Portland Cement.
15. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
16. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete.
17. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
18. ASTM C231/C231M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
19. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete.
20. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
21. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
22. ASTM C595/C595M - Standard Specification for Blended Hydraulic Cements.
23. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
24. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
25. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete.
26. ASTM C989/C989M - Standard Specification for Slag Cement for Use in Concrete and Mortars.
27. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
28. ASTM C1064/C1064M - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
29. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete.
30. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
31. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.

32. ASTM C1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
33. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
34. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
35. ASTM D5893/D5893M - Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements.
36. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
37. ASTM E408 - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
38. ASTM E903 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
39. ASTM E1918 - Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
40. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

1.04 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:

1. Submit required information regarding concrete materials, joint filler, admixtures, and curing compounds.
2. Mix Design:

a. Submit concrete mix design for each concrete strength prior to commencement of Work.
b. Submit separate mix designs if admixtures are required for hot- and cold-weather concrete Work.
c. Identify mix ingredients and proportions, including admixtures.

3. Identify chloride content of admixtures and whether or not chloride was added during manufacture.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Source Quality-Control Submittals: Indicate results of factory tests and inspections.

E. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

F. Qualifications Statement:

1. Submit qualifications for manufacturer and installer.

1.05 QUALITY ASSURANCE

A. Perform Work according to Sections 031000 - Concrete Forming and Accessories.

B. Obtain cementitious materials from same source throughout.

C. Perform Work according to NYS DOT standards.

D. Maintain one copy of each standard affecting Work of this Section on Site.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

B. Installer: Company specializing in performing Work of this Section with minimum three years' documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store materials according to manufacturer instructions.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.08 AMBIENT CONDITIONS

A. Section 01 50 00 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

B. Minimum Conditions: Do not place concrete if base surface temperature is less than 40 deg. F, or if surface is wet or frozen.

C. Subsequent Conditions: Maintain minimum 50 deg. F, for not less than 72 hours after placing, and at a temperature above freezing for remainder of curing period.

1.09 EXISTING CONDITIONS

A. Field Measurements:

1. Verify field measurements prior to fabrication.
2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.01 AGGREGATE SUBGRADE

A. As specified in Section 321123 - Aggregate Base Courses.

2.02 MATERIALS

A. Forms:

1. Description: As specified in Section 031000 - Concrete Forming and Accessories.
2. Height: Equal to full depth of finished sidewalk.

B. Reinforcement:

1. Reinforcing Steel and Wire Fabric: As specified in Section 032000 - Concrete Reinforcing.

2. Welded Plain-Wire Fabric:

a. Comply with ASTM A1064/A1064M.
b. Configuration: Flat sheets or Coiled rolls.
c. Finish: Uncoated.

3. Dowels:

a. Description: Plain steel bars.
b. Comply with ASTM A615/A615M.
c. Yield Strength: 60 ksi.
d. Length: As indicated on Drawings.
e. Ends: Square, with burrs removed.
f. Finish: Uncoated.

4. Tie Wire:

a. Type: Annealed.
b. Minimum Size: 16 gage.
c. Finish: Uncoated.

5. Epoxy Coating Patching Material: Type as recommended by coating manufacturer.

C. Concrete:

1. Concrete Materials:

    a. As specified in Section 033000 - Cast-in-Place Concrete.

2.03 FABRICATION

A. Reinforcing:

1. Comply with CRSI Manual of Practice.

B. Hooks:

1. As indicated on Drawings.
2. Type:

    a. Standard 180-degree bends.
    b. Seismic.

2.04 MIXES

A. Concrete:

1. Mix concrete according to ACI 301, and deliver concrete according to ASTM C94/C94M.
2. Mix Design:

    a. Compressive Strength: 4500 psi at 28 days.
    b. Slump: 2 to 4 inches.
    c. Maximum Water/Cement Ratio: .45.
    d. Air Entrainment: 5.5 percent.

3. Admixtures:

    a. Use accelerating admixtures in cold weather only if approved by Architect/Engineer in writing.
    b. Use of admixtures will not relax cold-weather placement requirements.
    c. Use calcium chloride only if approved by Architect/Engineer in writing.
    d. Use set-retarding admixtures during hot weather only if approved by Architect/Engineer in writing.

2.05 ACCESSORIES

A. Curing Compound:

1. Comply with ASTM C309.
2. Type: 1.
3. Class: A.

B. Joint Sealers: As specified in Section 079000 - Joint Protection.

C. Cover Sheets:

1. Comply with ASTM C171.

2.06 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. Testing: Comply with ASTM C94/C94M.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that compacted subgrade is dry and ready to support paving and imposed loads.

C. Verify that gradients and elevations of subgrade are as indicated on Drawings.

D. Verify reinforcing placement for proper size, spacing, location, and support.

3.02 PREPARATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Moisten substrate to minimize absorption of water from fresh concrete.

C. Notify Architect/Engineer minimum 24 hours prior to commencement of concreting operations.

3.03 INSTALLATION

A. Subgrade:

1. As specified in Section 321123 - Aggregate Base Courses.

B. Forms:

1. Place and secure forms and screeds to correct location, dimension, profile, and gradient.
2. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
3. Clean forms and coat with form oil each time before concrete is placed.

C. Reinforcement:

1. Place reinforcing as indicated on Drawings.
2. Interrupt reinforcing at contraction and expansion joints.
3. Place reinforcing to achieve indicated paving alignment.
4. Provide doweled joints at 12-inch spacing at interruptions of concrete.
5. Repair damaged epoxy coating to match shop finish.

D. Placing Concrete:

1. As specified in Section 033000 - Cast-in-Place Concrete.
2. Place concrete in forms in one layer.
3. Ensure that reinforcing, inserts, embedded parts, formed joints, and are not disturbed during concrete placement.
4. Place concrete continuously over full width of panel and between predetermined construction joints.
5. Do not break or interrupt successive pours such that cold joints occur.
6. Consolidate concrete by tamping and vibration.

E. Joints:

1. Place continuous transverse expansion joints at 5-foot intervals or width of sidewalk, whichever is less, or as indicated on Drawings.
2. Filler:

    a. Place joint filler between paving components and building or other appurtenances.
    b. Recess top of filler 1/4 inch for sealant installation.

3. Saw-cut contraction joints 3/16 inch wide at optimum time after finishing, cutting one-third into depth of slab.
4. Seal joints as indicated on Drawings and according to Section 07 90 00 - Joint Protection.

F. Finishing:

1. Wood float.
2. Texture Direction: Transverse to paving direction.
3. Ramps: Broom perpendicular to slope.
4. Place curing compound sealer on exposed concrete surfaces immediately after finishing.
5. Edges and Joints:

    a. Edger Radius: As indicated on Drawings.
    b. Spalled Corners and Edges: Clean and fill with mortar mixture and finish.

G. Curing:

1. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

H. Backfilling: After curing, backfill, grade, and compact adjacent disturbed area as indicated.

3.04 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.

B. Maximum Variation of Surface Flatness: 1/4 inch in 10 feet.

C. Maximum Variation from True Position: 1/4 inch.

D. Line and Grade for Forms: 1/8 inch in any 10-foot-long section.

3.05 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

C. Inspection and Testing:

1. Comply with ASTM C94/C94M.

2. Samples:

a. Sampling Procedures: Comply with ASTM C172/C172M.
b. Cylinder Molding and Curing Procedures: Comply with ASTM C31/C31M, field cured.
c. Sample concrete and make one set of four cylinders for every 25 cu. yd. or less of each class of concrete placed each day, and for every 1,500 sq. ft. of surface area paving.
d. Make one additional cylinder during cold-weather concreting, and field cure.

3. Cylinder Compressive Strength:

a. Comply with ASTM C39/C39M.
b. Test one cylinder at seven days, and two cylinders at 28 days.
c. Retain one cylinder for 56 days for testing when requested by Architect/Engineer.
d. Dispose of remaining cylinders if testing is not required.

4. Slump, Temperature, and Air Content:

a. Measure for each compressive-strength concrete sample.
b. Slump: Comply with ASTM C143/C143M.
c. Air Content: Comply with ASTM C173/C173M C231/C231M.
d. Temperature: Comply with ASTM C1064/C1064M.

5. Records:

a. Maintain records of placed concrete items.
b. Record date, location of pour, quantity, air temperature, number of test samples taken, and truck identification.

3.06 PROTECTION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, rain and flowing water, and mechanical injury.

C. Do not permit traffic over paving for minimum 7 days after finishing.

D. Damaged Concrete:

1. Remove and reconstruct concrete that has been damaged for entire length between scheduled joints.
2. Refinishing damaged portion is not acceptable.
3. Dispose of damaged portions.

END OF SECTION

# SECTION 32 17 23 - PAVEMENT MARKINGS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Traffic lines and markings.
2. Legends.
3. Paint.

B. Related Requirements:

1. None.

### 1.2 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:

1. AASHTO M247 - Standard Specification for Glass Beads Used in Pavement Markings.

B. ASTM International:

1. ASTM D34 - Standard Guide for Chemical Analysis of White Pigments.
2. ASTM D126 - Standard Test Methods for Analysis of Yellow, Orange, and Green Pigments Containing Lead Chromate and Chromium Oxide Green.
3. ASTM D562 - Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer.
4. ASTM D711 - Standard Test Method for No-Pick-Up Time of Traffic Paint.
5. ASTM D713 - Standard Practice for Conducting Road Service Tests on Fluid Traffic Marking Materials.
6. ASTM D1301 - Standard Test Methods for Chemical Analysis of White Lead Pigments.
7. ASTM D1394 - Standard Test Methods for Chemical Analysis of White Titanium Pigments.
8. ASTM D1475 - Standard Test Method for Density of Liquid Coatings, Inks, and Related Products.
9. ASTM D1640/D1640M - Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings.
10. ASTM D2202 - Standard Test Method for Slump of Sealants.
11. ASTM D2371 - Standard Test Method for Pigment Content of Solvent-Reducible Paints.
12. ASTM D2621 - Standard Test Method for Infrared Identification of Vehicle Solids From Solvent-Reducible Paints.
13. ASTM D2743 - Standard Practices for Uniformity of Traffic Paint Vehicle Solids by Spectroscopy and Gas Chromatography.

14. ASTM D4280 - Standard Specification for Extended Life Type, Nonplowable, Raised Retroreflective Pavement Markers.
15. ASTM D4505 - Standard Specification for Preformed Retroreflective Pavement Marking Tape for Extended Service Life.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit paint formulation for each type of paint.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Test and Evaluation Reports: Indicate source and acceptance test results according to AASHTO M247.

E. Manufacturer Instructions:

1. Submit instructions for application temperatures, eradication requirements, application rate, line thickness, type of glass beads, and bead embedment and application rate.
2. Submit detailed instructions on installation requirements, including storage and handling procedures.

F. Source Quality-Control Submittals: Indicate results of factory tests and inspections.

G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

H. Qualifications Statements:

1. Submit qualifications for manufacturer and applicator.
2. Submit manufacturer's approval of applicator.

1.4 QUALITY ASSURANCE

A. Perform Work according to New York state standards.

B. Maintain one copy of each standard affecting Work of this Section on Site.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

B. Applicator: Company specializing in performing Work of this Section with minimum three years' documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Storage:

1. According to manufacturer instructions.
2. Paint:

a. Invert containers several days prior to use if paint has been stored more than two months.
b. Minimize exposure to air when transferring paint.
c. Seal drums and tanks when not in use.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.7 AMBIENT CONDITIONS

A. Section 01 50 00 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

B. Do not apply materials if surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.

C. Do not apply exterior coatings during rain or snow if relative humidity is outside range required by paint manufacturer, or if moisture content of surfaces exceeds that required by paint manufacturer.

D. Minimum Conditions: Do not apply paint if temperatures are expected to fall below50 deg. F within 24 hours after application.

E. Thermoplastic Compound: Do not apply unless pavement surface temperature is minimum 40 deg. F and rising.

F. Maximum VOCs: Do not exceed limit required by State or Environmental Protection Agency.

1.8 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.

B. Furnish three-year manufacturer's warranty for pavement markings.

## PART 2 - PRODUCTS

### 2.1 PAINTED PAVEMENT MARKINGS

A. Furnish materials according to NYSDOT standards.

B. Performance and Design Criteria:

1. Paint Adhesion: Adhere to road surface, forming smooth continuous film one minute after application.
2. Paint Drying: Tack free by touch as not to transfer by vehicle tires within two minutes after application.

### 2.2 APPLICATION EQUIPMENT

A. Paint Gun:

1. Description: Simultaneously apply parallel lines of indicated width in solid or broken patterns or various combinations of those patterns.
2. Type: Dual nozzle.

B. Measuring Device: Automatically and continuously measure to nearest foot length of each line placed.

### 2.3 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. Certificate of Compliance:

1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.
2. Specified shop tests are not required for Work performed by approved manufacturer.

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for application preparation.

B. Do not apply paint to concrete surfaces until concrete has cured for 28 days.

C. Agitate paint for 1 to 15 minutes prior to application to ensure even distribution of pigment.

D. Maintenance and Protection of Traffic:

1. Provide short-term traffic control as specified in Section 01 50 00 - Temporary Facilities and Controls.
2. Prevent interference with marking operations and prevent traffic on newly applied markings before dry.
3. Maintain access to existing building, and other properties requiring access.

E. Surface Preparation.

1. Clean and dry paved surfaces 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 o.c.
4. Request inspection by Engineer after placing pavement spots and minimum three days prior to applying traffic lines.

## 3.2 DEMOLITION

A. Remove existing markings in an acceptable manner, using methods that will cause least damage to pavement structure or surface.

B. Do not remove existing pavement markings by painting over with blank paint.

C. Repair pavement or surface damage caused by removal methods.

D. Clean and repair existing, remaining, or reinstalled lines and legends.

## 3.3 APPLICATION

A. Application Rate: Per manufacturer recommendation.

B. Painting:

1. Apply paint pneumatically, using guidelines and templates as necessary to control application.
2. Manually paint numbers, letters, and symbols.
3. Prevent splattering and overspray when applying markings.
4. Paint Guns: Simultaneously apply paint binder at uniform specified rates.
5. Dispense at ambient temperature.

C. Dimensions and Locations: As indicated on Drawings.

D. Crosswalks, Intersections, Stop Lines, and Legends:

1. Use walk-behind stripers, hand spray, or stencil trucks.
2. Do not use hand brushes or rollers.

## 3.4 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.

B. Maximum Variation from Wet Film Thickness: 1 mil.

C. Maximum Variation from Wet Paint Line Width: Plus or minus 1/8 inch.

## 3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Inspect for incorrect location, insufficient thickness, line width, coverage, retention, uncured or discolored material, and insufficient bonding.

C. Acceptance:

1. Repair lines and markings which after application and curing do not meet following criteria:

a. Incorrect location.
b. Insufficient thickness, width, coverage, or retention.
c. Uncured or discolored material.
d. Insufficient bonding.

## 3.6 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

B. Collect and legally dispose of residues from painting operations.

## 3.7 PROTECTION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Protect painted pavement markings from vehicular and pedestrian traffic until paint is dry and track free.

C. Unless material is track free at end of paint application convoy, use traffic cones to protect markings from traffic until track free.

D. If vehicle crosses a marking and tracks it, or if splattering or overspray occurs, eradicate affected marking and resultant tracking and apply new markings.

E. Follow manufacturer instructions or use minimum of 30 minutes of dry time.

F. Barrier cones are satisfactory protection for materials being dried.

3.8 MAINTENANCE

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for maintenance service.

B. Provide service and maintenance of traffic paints for three years from date of Substantial Completion.

END OF SECTION

SECTION 32 31 13

CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Fence framework, fabric, and accessories.
2. Excavation for post bases.
3. Concrete foundation for posts and center drop for gates.
4. Manual gates and related hardware.
5. Privacy slats.

B. Related Sections:

1. Section 03 30 00 - Cast-in-Place Concrete.

1.02 REFERENCES

A. ASTM International:

1. ASTM A121 - Standard Specification for Metallic-Coated Carbon Steel Barbed Wire.
2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
4. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
5. ASTM A491 - Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric.
6. ASTM A817 - Standard Specification for Metallic-Coated Steel Wire for Chain-Link Fence Fabric and Marcelled Tension Wire.
7. A1011/A1011M-07 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
8. ASTM B429/B429M - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
9. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
10. ASTM F552 - Standard Terminology relating to Chain Link Fencing.
11. ASTM F567 - Standard Practice for Installation of Chain-Link Fence.
12. ASTM F626 - Standard Specification for Fence Fittings.
13. ASTM F668 - Standard Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric.
14. ASTM F900 - Standard Specification for Industrial and Commercial Swing Gates.

15. ASTM F934 - Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials.
16. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.
17. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
18. ASTM F1183 - Standard Specification for Aluminum Alloy Chain Link Fence Fabric.
19. ASTM F1184 - Standard Specification for Industrial and Commercial Horizontal Slide Gates.
20. ASTM F1345 - Standard Specification for Zinc - 5% Aluminum -Mischmetal Alloy-Coated Steel Chain-Link Fence Fabric.

B. Chain Link Fence Manufacturers Institute:

1. CLFMI - Product Manual.

## 1.03 SYSTEM DESCRIPTION

A. Fence Height: as indicated on Drawings.

B. Line Post Spacing: At intervals not exceeding 10 feet.

C. Fence Post and Rail Strength: Conform to ASTM F1043 Heavy Industrial Fence quality.

## 1.04 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.

C. Product Data: Submit data on fabric, posts, accessories, fittings and hardware.

D. Samples: Submit two samples of fence fabric, and slat infill, 6x6 inch in size illustrating construction and colored finish.

E. Manufacturer's Installation Instructions: Submit installation requirements, post foundation anchor bolt templates, and hardware and gates.

## 1.05 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Accurately record actual locations of property perimeter posts relative to property lines and easements.

C. Operation and Maintenance Data: Procedures for submittals.

1.06 QUALITY ASSURANCE

A. Supply material according to CLFMI - Product Manual.

B. Perform installation according to ASTM F567.

C. Maintain one copy of each document on site.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum three years documented experience.

1.08 DELIVERY, STORAGE AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Deliver fence fabric and accessories in packed cartons or firmly tied rolls.

C. Identify each package with manufacturer's name.

D. Store fence fabric and accessories in secure and dry place.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers:

1. Anchor Fence, Inc.
2. Allied Fence.
3. Page Aluminized Steel Corp.
4. As indicated on Drawings.
5. Substitutions: Section 01 60 00 - Product Requirements.

2.02 MATERIALS AND COMPONENTS

A. Materials and Components: Conform to CLFMI Product Manual.

2.03 MATERIALS

A. Framing (Steel): ASTM F1083 Schedule 40 galvanized steel pipe, welded construction, minimum yield strength of 50 ksi; coating conforming to ASTM F1043 Type A on pipe exterior and interior.

B. Fabric Wire (Steel): ASTM F668 PVC coated steel wire.

C. Concrete: Type specified in Section 033000.

2.04 COMPONENTS

A. Line Posts: 2.5-inch diameter.

B. Corner and Terminal Posts: 3.5 inch.

C. Gate Posts: 3.5-inch diameter.

D. Top and Brace Rail: 1.66-inch diameter, plain end, sleeve coupled.

E. Gate Frame: 3-inch diameter for fittings and truss rod fabrication.

F. Fabric: 2-inch diamond mesh interwoven wire, 9 gage thick, top salvage knuckle end closed, bottom selvage knuckle end closed.

G. Tension Wire: 6 gage thick steel, single strand, marcelled, spiraled, or crimped, aluminum-coated tension wire conforming to ASTM A824.

H. Tension Band: 14 gage by 3/4 inch thick steel.

I. Tension Strap: 3/16-inch-thick steel.

J. Tie Wire: Aluminum alloy steel wire.

2.05 ACCESSORIES

A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners, and fittings; vinyl coated

2.06 GATES

A. General:

1. Gate Types, Opening Widths and Directions of Operation: As indicated on Drawings.
2. Factory assemble gates.
3. Conform to requirements specified for PVC coated steel chain link fence except that PVC coated aluminum alloy framing conforming to ASTM B429/B429M may be used.
4. Design gates for operation by one person.

B. Swing Gates:

1. Fabricate gates to permit 180-degree swing.
2. Gates Construction: ASTM F900 with welded corners. Use of corner fittings is not permitted.

2.07 FINISHES

A. Components and Fabric: Vinyl coating, black color according to ASTM F934 as selected, over galvanized coating.

B. Vinyl Components: color to match fabric as selected.

C. Hardware: Galvanized to ASTM A153/A153M, 1.8 oz/sq ft coating.

D. Accessories: Same finish as fabric.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install framework, fabric, accessories and gates according to ASTM F567.

B. Set intermediate, terminal, gate, posts plumb, in concrete footings with top of footing 6 inches below finish grade. Slope top of concrete for water runoff.

C. Line Post Footing Depth Below Finish Grade: ASTM F567 4 feet.

D. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F567 4 feet.

E. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.

F. Install top rail through line post tops and splice with 6-inch-long rail sleeves.

G. Install center and bottom brace rail on corner gate leaves.

H. Place fabric on outside of posts and rails.

I. Do not stretch fabric until concrete foundation has cured 28 days.

J. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.

K. Position bottom of fabric 3.5 inches above finished grade.

L. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.

M. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

N. Install bottom tension wire stretched taut between terminal posts.

O. Install support arms sloped inward and outward and attach barbed wire, tension and secure.

P. Support gates from gate posts. Do not attach hinged side of gate from building wall.

Q. Install gate with fabric to match fence. Install three hinges on each gate leaf, latch, catches, drop bolt foot bolts and sockets.

R. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.

S. Install posts with 6 inches maximum clear opening from end posts to buildings, fences and other structures.

T. Excavate holes for posts to diameter and spacing indicated on Drawings without disturbing underlying materials.

U. Center and align posts. Place concrete around posts and vibrate or tamp for consolidation. Verify vertical and top alignment of posts and make necessary corrections.

V. Allow footings to cure minimum 7 days before installing fabric and other materials attached to posts.

3.02 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation From Plumb: 1/8 inch.

C. Maximum Offset From Indicated Position: 1 inch.

END OF SECTION

# SECTION 32 91 13

# SOIL PREPARATION

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Preparation of subsoil.
2. Soil testing.
3. Placing topsoil.

B. Related Sections:

1. Section 31 22 13 - Rough Grading: Rough grading of site.
2. Section 31 23 16.13 - Trenching: Rough grading over cut.
3. Section 32 05 13 - Soils for Exterior Improvements: Topsoil material.
4. Section 32 91 19 - Landscape Grading: Preparation of subsoil and placement of topsoil in preparation for the Work of this section.
5. Section 32 92 19 - Seeding
6. Section 32 92 23 - Sodding.

### 1.02 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Grassed Areas:

1. Basis of Measurement: By square foot.
2. Basis of Payment: Includes preparation of subsoil topsoil, placing topsoil.

### 1.03 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Submit minimum 10 oz sample of topsoil proposed. Forward sample to approved testing laboratory in sealed containers to prevent contamination.

C. Test Reports: Indicate topsoil nutrient and pH levels with recommended soil supplements and application rates.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

A. Maintain one copy of each document on site.

1.05 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Coordinate with installation of underground sprinkler system piping and watering heads.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. Topsoil: As specified in Section 320513.

2.02 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

C. Provide recommendation for fertilizer and lime application rates for specified seed mix as result of testing.

D. Testing is not required when recent tests and certificates are available for imported topsoil. Submit these test results to testing laboratory. Indicate, by test results, information necessary to determine suitability.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify prepared soil base is ready to receive the Work of this section.

3.02 PREPARATION OF SUBSOIL

A. Prepare sub-soil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated sub-soil.

C. Scarify subsoil to depth of 3 inches where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted sub-soil.

3.03 PLACING TOPSOIL

A. Spread topsoil to minimum depth of 6 inches over area to be seeded. Rake until smooth.

B. Place topsoil during dry weather and on dry unfrozen subgrade.

C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.

D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

E. Install edging at periphery of seeded areas in straight lines to consistent depth.

END OF SECTION

SECTION 32 91 19

LANDSCAPE GRADING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Final grade topsoil for finish landscaping.

B. Related Sections:

1. Section 31 22 13 - Rough Grading: Site contouring.
2. Section 31 23 16.13 - Trenching: Backfilling trenches.
3. Section 31 23 23 - Fill: Backfilling at building areas.
4. Section 32 05 13 - Soils for Exterior Improvements.
5. Section 32 92 19 - Seeding and 32 92 23 “Sodding”: Finish ground cover.

1.02 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Topsoil:

1. Basis of Measurement: By cubic yard.
2. Basis of Payment: Includes supplying topsoil materials, stockpiling, preparing and scarifying substrate surface, placing where required, and rolling.

1.03 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures

B. Samples: Submit, in air-tight containers, 10 lb sample of each type of fill to testing laboratory.

C. Materials Source: Submit name of imported materials source.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

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

B. Maintain one copy on site.

PART 2 - PRODUCTS

2.01 MATERIAL

A. Topsoil: Fill Type S2 and S6 as specified in Section 329300.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify building and trench backfilling have been inspected.

C. Verify substrate base has been contoured and compacted.

3.02 PREPARATION

A. Protect landscaping and other features remaining as final Work.

B. Protect existing structures, fences, sidewalks, utilities, paving, and curbs.

3.03 SUBSTRATE PREPARATION

A. Eliminate uneven areas and low spots.

B. Remove debris, roots, branches, stones, in excess of 1 inch in size. Remove contaminated subsoil.

C. Scarify surface to depth of 3 inches where topsoil is scheduled. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.04 PLACING TOPSOIL

A. Place topsoil in areas where seeding, sodding, planting, is required. to thickness as scheduled. to nominal depth of 6 inches. Place topsoil during dry weather.

B. Fine grade topsoil to eliminate rough or low areas. Maintain profiles and contour of subgrade.

C. Remove roots, weeds, rocks, and foreign material while spreading.

D. Manually spread topsoil close to plant material, building, and to prevent damage.

E. Lightly compact placed topsoil.

F. Remove surplus subsoil and topsoil from site.

G. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.05 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Top of Topsoil: Plus or minus 1/2 inch.

3.06 PROTECTION OF INSTALLED WORK

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Prohibit construction traffic over topsoil.

3.07 SCHEDULES

A. Compacted topsoil thicknesses:

1. Seeded Grass: 6 inches.
2. Sod: 4 inches.
3. Shrub Beds: 18 inches.
4. Flower Beds: 12 inches.
5. Planter Boxes: To within 3 inches of box rim.

END OF SECTION

# SECTION 32 92 19

# SEEDING

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Fertilizing.
2. Seeding.
3. Hydroseeding.
4. Mulching.
5. Maintenance.

B. Related Sections:

1. Section 31 22 13 - Rough Grading: Rough grading of site.
2. Section 31 23 16.13 - Trenching: Rough grading over cut.
3. Section 32 05 13 - Soils for Exterior Improvements: Topsoil material.
4. Section 32 84 00 - Planting Irrigation.
5. Section 32 91 13 - Soil Preparation
6. Section 32 91 19 - Landscape Grading: Preparation of subsoil and placement of topsoil in preparation for the Work of this section.
7. Section 32 92 23 - Sodding.

### 1.02 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Grassed Areas:

1. Basis of Measurement: By square foot.
2. Basis of Payment: Includes seeding, watering and maintenance to specified time limit.

### 1.03 REFERENCES

A. ASTM International:

1. ASTM C602 - Standard Specification for Agricultural Liming Materials.

### 1.04 DEFINITIONS

A. Weeds: Vegetative species other than specified species to be established in given area.

1.05 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data for seed mix, fertilizer, mulch, hydroseed, sod, and other accessories.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.06 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Operation and Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

1.07 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.

B. Maintain one copy of each document on site.

1.08 QUALIFICATIONS

A. Seed Supplier: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum three years documented experience.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

C. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.10 MAINTENANCE SERVICE

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for maintenance service.

B. Maintain seeded areas immediately after placement until grass is well established and exhibits vigorous growing condition for two cuttings.

PART 2 - PRODUCTS

2.01 SEED MIXTURE

A. Substitutions: Section 01 60 00 - Product Requirements.

B. Description:

1. Timothy: 30 percent.
2. Kentucky Blue Grass: 25 percent.
3. Red Top: 10 percent.
4. Norlea Perennial Rye: 30 percent.
5. Clover: 5 percent.

2.02 ACCESSORIES

A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

B. Fertilizer: Commercial grade; recommended for grass; of proportion necessary to eliminate deficiencies of topsoil.

C. Lime: ASTM C602, Class T agricultural limestone containing a minimum 80 percent calcium carbonate equivalent.

D. Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass.

E. Erosion Fabric: Jute matting, open weave.

F. Stakes: Softwood lumber, chisel pointed.

2.03 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Provide recommendation for fertilizer and lime application rates for specified seed mix as result of testing.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify prepared soil base is ready to receive the Work of this section.

3.02 FERTILIZING

A. Apply lime at application rate recommended by soil analysis. Work lime into top 6 inches of soil.

B. Apply fertilizer at application rate recommended by soil analysis.

C. Apply after smooth raking of topsoil.

D. Do not apply fertilizer at same time or with same machine used to apply seed.

E. Mix fertilizer thoroughly into upper 2 inches of topsoil.

F. Lightly water soil to aid dissipation of fertilizer. Irrigate top level of soil uniformly.

3.03 SEEDING

A. Apply seed at rate of 2.3 lbs per 1000 sq ft evenly in two intersecting directions. Rake in lightly.

B. Do not seed areas in excess of that which can be mulched on same day.

C. Planting Season: April through October.

D. Do not sow immediately following rain, when ground is too dry, or when winds are over 12 mph.

E. Immediately following seeding and compacting, apply mulch to thickness of 1/8 inches. Maintain clear of shrubs and trees.

F. Apply water with fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

3.04 HYDROSEEDING

A. Apply fertilizer, mulch and seeded slurry with hydraulic seeder at rate of 45 lbs per 1000 sq ft evenly in one pass.

B. After application, apply water with fine spray immediately after each area has been hydroseeded. Saturate to 4 inches of soil and maintain moisture levels two to four inches.

3.05 SEED PROTECTION

A. Identify seeded areas with stakes and string around area periphery. Set string height to 24 inches. Space stakes at 60 inches.

B. Cover seeded slopes where grade is 4 inches per foot or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

C. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Overlap edges and ends of adjacent rolls minimum 12 inches. Backfill trench and rake smooth, level with adjacent soil.

D. Secure outside edges and overlaps at 36 inch intervals with stakes.

E. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

F. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.06 MAINTENANCE

A. Mow grass at regular intervals to maintain at maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at each mowing. Perform first mowing when seedlings are 40 percent higher than desired height.

B. Neatly trim edges and hand clip where necessary.

C. Immediately remove clippings after mowing and trimming. Do not let clippings lay in clumps.

D. Water to prevent grass and soil from drying out.

E. Roll surface to remove minor depressions or irregularities.

F. Control growth of weeds. Apply herbicides. Remedy damage resulting from improper use of herbicides.

G. Immediately reseed areas showing bare spots.

H. Repair washouts or gullies.

I. Protect seeded areas with warning signs during maintenance period.

END OF SECTION

# SECTION 32 92 23

# SODDING

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Preparation of subsoil.
2. Placement of topsoil.
3. Fertilization.
4. Sod installation.
5. Maintenance.

B. Related Requirements:

1. Section 31 23 16.13 - Trenching: Rough grading over cut.
2. Section 31 23 23 - Fill: Rough grading of Site.
3. Section 32 05 13 - Soils for Exterior Improvements: Topsoil material.
4. Section 32 91 19 - Landscape Grading: Preparation of subsoil and placement of topsoil in preparation for Work of this Section.
5. Section 32 92 19 - Seeding: Seeding and soil supplements.

### 1.02 DEFINITIONS

A. Weeds: Vegetative species other than specified species to be established in given area.

### 1.03 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Section 01 20 00 - Price and Payment Procedures: Contract Sum/Price modification procedures.

B. Sodded Areas:

1. Basis of Measurement: By square foot.
2. Basis of Payment:

a. Includes preparation of subsoil, preparation of topsoil, and placement of topsoil.
b. Includes sodding and watering.
c. Includes maintenance based on specified time limit.

### 1.04 REFERENCE STANDARDS

A. ASTM International:

1. ASTM C602 - Standard Specification for Agricultural Liming Materials.

B. Turfgrass Producers International:

1. TPI - Guideline Specifications to Turfgrass Sodding.

## 1.05 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Coordinate Work of this Section with installation of underground sprinkler system piping and watering heads.

## 1.06 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:

1. Submit sod producer's information for sod grass species.
2. Submit manufacturer information for fertilizer, mulch, and other accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Sod Producer's Certificate: Certify that sod grass meets or exceeds specified requirements.

E. Test and Evaluation Reports: Indicate topsoil nutrient and pH levels, with recommended soil supplements and application rates.

F. Qualifications Statements:

1. Submit qualifications for sod producer, manufacturer, and installer.
2. Submit sod producer's approval of installer.

## 1.07 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Operation and Maintenance Data:

1. Submit maintenance instructions, cutting method, and maximum grass height.
2. Submit fertilizer types, application frequency, and recommended coverage.

1.08 QUALITY ASSURANCE

A. Sod: Ensure root development capable of supporting its own weight without tearing when suspended vertically by holding upper two corners.

1.09 QUALIFICATIONS

A. Sod Producer: Company specializing in products as specified in this Section with minimum three years' documented experience.

B. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

C. Installer: Company specializing in performing Work of this Section with minimum three years' documented experience and approved by sod producer.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Delivery:

1. Deliver sod on pallets or in rolls.
2. Do not deliver more sod than can be laid within 24 hours.

C. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

D. Store materials according to manufacturer instructions.

E. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Protect exposed roots from dehydration.
3. Provide additional protection according to manufacturer instructions.

1.11 AMBIENT CONDITIONS

A. Section 01 50 00 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

B. Minimum Conditions: Do not place sod when temperature is lower than 32 deg. F.

PART 2 - PRODUCTS

2.01 SOD

A. Sod Growers:

1. Batavia Turf.
2. DeLea Sod.
3. Sky High Turf Farms.
4. Substitutions: As specified in Section 01 60 00 - Product Requirements.

B. Description:

1. Cultivated grass sod with strong fibrous root system, free of stones and burned or bare spots.
2. Grade: Field grown.
3. Type: As indicated in plant schedule on Drawings.
4. Weed Density: No more than five weeds per 1,000 sq. ft.

2.02 MATERIALS

A. Topsoil:

1. As specified in Section 32 05 13 - Soils for Exterior Improvements.

B. Topsoil:

1. Description: Fertile, agricultural soil typical for locality, capable of sustaining vigorous plant growth, and taken from drained Site.
2. Free of subsoil, clay, impurities, plants, weeds, and roots.
3. pH:

a. Minimum: 5.4.
b. Maximum: 7.0.

2.03 ACCESSORIES

A. Fertilizer:

1. Grade: Commercial.
2. Description: As recommended for grass, with 50 percent of elements derived from organic sources.
3. Proportions: As necessary to eliminate deficiencies of topsoil.

B. Lime:

1. Description: Agricultural limestone containing a minimum of 80 percent calcium carbonate equivalent.

2. Comply with ASTM C602.

3. Class: T.

C. Water: Clean, fresh, and free of substances or matter capable of inhibiting vigorous growth of grass.

D. Wood Pegs: Softwood, sufficient size and length to anchor sod on slope.

E. Wire Mesh:

1. Description: Interwoven hexagonal plastic mesh.
2. Size: 2 inches.

## 2.04 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. Analysis: Ascertain pH and percentage of nitrogen, phosphorus, potash, soluble salt content, and organic matter.

C. Provide recommendation for fertilizer and lime application rates for specified sod grass species based on testing.

D. Prior Tests:

1. Testing is not required if recent tests are available for imported topsoil.
2. Submit such test results to testing laboratory.
3. Indicate, based on test results, information necessary to determine suitability.

# PART 3 - EXECUTION

## 3.01 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that prepared soil base is ready to receive Work of this Section.

## 3.02 INSTALLATION

A. Subsoil Preparation:

1. Eliminate uneven areas and low spots.
2. Maintain indicated lines, levels, profiles, and contours.
3. Slopes:

a. Make gradual changes in grade.

b. Blend slopes into level areas.

4. Foreign Materials:

a. Remove foreign materials and undesirable plants and their roots.
b. Do not bury foreign materials beneath areas to be sodded.

5. Remove contaminated subsoil.
6. Scarify subsoil to depth of 4 inches where topsoil is to be placed.
7. Repeat cultivation in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

B. Placing of Topsoil:

1. Spread topsoil to minimum depth of 4 inches over area to be sodded.
2. Place topsoil during dry weather and on dry unfrozen subgrade.
3. Remove vegetable matter and foreign nonorganic material from topsoil while spreading.
4. Grade topsoil to eliminate rough, low, or soft areas, and to ensure positive drainage.
5. Install edging at periphery of sodded areas in straight lines to consistent depth.

C. Fertilizing:

1. Apply lime at application rate recommended by soil analysis.
2. Work lime into top 6 inches of soil.
3. Apply fertilizer at application rate recommended by soil analysis.
4. Apply fertilizer after smooth raking of topsoil and prior to installation of sod.
5. Apply fertilizer no more than 48 hours before laying sod.
6. Mix fertilizer thoroughly into upper 4 inches of topsoil.
7. Lightly water soil to aid dissipation of fertilizer.

D. Laying of Sod:

1. Moisten prepared surface immediately prior to laying sod.
2. Lay sod within 24 hours after harvesting to prevent deterioration.
3. Joints:

a. Lay sod tightly with no open joints visible and no overlapping.
b. Stagger end joints minimum 12 inches.
c. Do not stretch or overlap sod pieces.

4. Lay smooth and align with adjoining grass areas.
5. Place top elevation of sod 1/2 inch below adjoining edging, paving, and curbs.
6. Slopes:

a. On slopes 6 in./ft. and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at maximum 2 feet o.c.
b. If using "big roll," lay sod parallel to slope.
c. Drive pegs flush with soil portion of sod.

d. Prior to placing sod on slopes exceeding 8 in./ft. or where indicated, place wire mesh over topsoil and securely anchor wire mesh in place with wood pegs sunk firmly into ground.

7. Watering:

a. Water sodded areas immediately after installation.
b. Saturate sod to 4 inches of soil.

8. Rolling:

a. After sod and soil have dried, roll sodded areas to bond sod to soil and to remove minor depressions and irregularities.
b. Roll sodded areas with roller not exceeding 110 lb.
c. Roll before first watering.

## 3.03 MAINTENANCE

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for maintenance service.

B. Maintain sodded areas immediately after placement until grass is well established and exhibits vigorous growing condition.

C. Mowing:

1. Mow grass at regular intervals to maintain at maximum height of 2-1/2 inches.
2. Do not cut more than 1/3 of grass blade at each mowing.
3. Neatly trim edges and hand-clip where necessary.
4. Immediately remove clippings after mowing and trimming.

D. Water to prevent grass and soil from drying out.

E. Roll surface to remove irregularities.

F. Weed Control:

1. Control growth of weeds by applying herbicides.
2. Remedy damage resulting from improper use of herbicides.

G. Immediately replace sod on areas showing deterioration or bare spots.

H. Protect sodded areas with warning signs during maintenance period.

END OF SECTION

SECTION 33 01 10.58

DISINFECTION OF WATER UTILITY PIPING SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Disinfection chemicals.

B. Related Requirements:

1. None.

1.02 SUBMITTALS

A. Disinfection Procedure:

1. Submit description of procedure, including type of disinfectant and calculations indicating quantities of disinfectants required to produce specified chlorine concentration.

B. Product Data: Submit manufacturer information for proposed chemicals and treatment doses.

C. Certify that final water complies with disinfectant quality standards of City of Binghamton Water Department.

D. Material Test Reports: For each disinfectant, by a qualified testing agency.

E. Field Quality-Control Reports: For disinfection chemicals.

F. Qualifications Statements: For manufacturer and applicator.

1.03 CLOSEOUT SUBMITTALS

A. Disinfection Report:

1. Type and form of disinfectant used.
2. Date and time of disinfectant injection start and completion.
3. Test locations.
4. Name of person collecting samples.
5. Initial and 24-hour disinfectant residuals in treated water in ppm for each outlet tested.
6. Date and time of flushing start and completion.
7. Disinfectant residual after flushing in ppm for each outlet tested.

B. Lead Content Report:

1. Date issued, project name, and testing laboratory name, address, and telephone number.
2. Date and time of water sample collection.
3. Test locations.
4. Name of person collecting samples.
5. Lead content test results for each outlet tested reported in ppm.
6. Certify lead content conforms, or fails to conform, to lead standards of New York State Department of Health.

1.04 QUALITY ASSURANCE

A. Manufacturers Qualifications: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

B. Applicators Qualifications: Company specializing in performing Work of this Section with minimum three years' documented experience.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Perform Work according to:

1. The Municipality of City of Binghamton Department of Public Works standards.

2.02 DISINFECTION CHEMICALS

A. Chemicals: American Water Works Association:

1. Hypochlorite: Comply with AWWA B300.

B. New York State Department of Health:

1. 10 NYRCC Subpart 67-4 Lead Testing in School Drinking Water: Effective March 3, 2017.

PART 3 - EXECUTION

3.01 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. Verify that piping system has been cleaned, inspected, and pressure tested.

C. Verify that access fittings have been installed under Section 33 14 16 "Site Water Utility Distribution Piping."

D. Perform scheduling and disinfecting activity with startup, water pressure testing, adjusting and balancing, and demonstration procedures, including coordination with related systems.

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

## 3.02 INSTALLATION OF DISINFECTION CHEMICALS

A. Provide required equipment to perform Work of this Section.

B. Introduce treatment into piping system.

C. Maintain disinfectant in system for 24 hours in accordance with manufacturers recommendations.

D. Flush, circulate, and clean until required disinfectant quality standard has been achieved using municipal domestic water.

E. Replace permanent system devices that were removed for disinfection.

## 3.03 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Disinfection, Flushing, and Sampling:

1. Disinfect pipeline installation according to AWWA C651.
2. Use of liquid chlorine is not permitted.
3. Upon completion of retention period required for disinfection, flush pipeline until chlorine concentration in water leaving pipeline is no higher than that generally prevailing in existing system or is acceptable for domestic use.
4. Disposal:

    a. Legally dispose of chlorinated water.
    b. If chlorinated discharge may cause damage to environment, apply neutralizing chemical to chlorinated water to neutralize chlorine residual remaining in water.

5. After final flushing and before pipeline is connected to existing system or placed in service, certify that disinfectant level meets quality standards of authority having jurisdiction.

C. Prepare test and inspection reports.

END OF SECTION

# SECTION 33 01 30.86

# MANHOLE RIM ADJUSTMENT

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Manhole frames and covers.
2. Riser rings.

B. Related Requirements:

1. Section 32 12 16 "Asphalt Paving" for restoration of bituminous paving areas.
2. Section 32 91 19 "Landscape Grading" for restoration of grassed areas.
3. Section 32 92 19 "Seeding" for restoration of grassed areas.

### 1.02 UNIT PRICES

A. Raising Manhole Frames and Covers:

1. Basis of Measurement: By each.
2. Basis of Payment: Includes removal and reinstalling manhole frame and cover, manhole rings, and joint sealant.

B. Repairing Manhole Frames and Covers:

1. Basis of Measurement: By each.
2. Basis of Payment: Includes removal of old frame and cover, installing new frame and cover, and joint sealant.

### 1.03 SUBMITTALS

A. Product Data: Submit manufacturer information for manhole covers and riser rings construction, features, configuration, and dimensions.

B. Qualifications Statements: For manufacturer and installer.

C. Manufacturer's Approval: For installer.

### 1.04 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual grade-adjusted elevation of manholes.

1.05 QUALITY ASSURANCE

A. Manufacturers Qualifications: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

B. Installers Qualifications: Company specializing in performing Work of this Section with minimum three years' documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

B. Store materials according to manufacturer's instructions.

C. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

PART 2 - PRODUCTS

2.01 MANHOLE FRAMES AND COVERS

A. Manufacturers:

1. EJ.
2. Neenah Foundry Company.
3. Approved Equal

B. Material: Cast iron.

C. Comply with ASTM A48/A48M, Class 30B.

D. Surface: Machined flat bearing.

E. Lid: Removable.

F. Cover Design: Closed, Open checkerboard grille, and Waterproof.

G. Live Load Rating: H5-25 psf.

H. Cover: Molded with identifying name and logo.

2.02 RISER RINGS

A. Manufacturers:

1. EJ.
2. Neenah Foundry Company.
3. Approved Equal

B. Riser Rings:

1. Thickness of 4 Inches to 6 Inches.

a. Material: Precast concrete.
b. Comply with ASTM C478.

2. Thickness of Less than 4 Inches (100 mm):

a. Material: Cast iron.
b. Comply with AASHTO M306.

3. Rubber Seal Wraps:

a. Wraps and Band Widths: Comply with ASTM C877, Type III.
b. Cone/Riser Ring Joint: Minimum 3-inch overlap.
c. Frame/Riser Ring Joint: 2-inch overlap.
d. Additional Bands: Overlap upper band by 2 inches.

## 2.03 SOURCE QUALITY CONTROL

A. Provide shop inspection and testing of completed assembly.

B. Certificate of Compliance:

1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.
2. Specified shop tests are not required for Work performed by approved manufacturer.

# PART 3 - EXECUTION

## 3.01 EXAMINATION

A. Verify and locate manholes requiring grade adjustment.

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

## 3.02 INSTALLATION OF MANHOLE FRAMES AND COVERS

A. Raising Manhole Frames and Covers:

1. Locate and raise manholes to grade as indicated on Drawings.
2. Use flat or tapered rubber manhole rings to achieve indicated elevation for frame and cover.

3. Do not adjust elevation greater than 6 inches with rubber manhole rings.
4. Use sealant to seal joints between manhole top, rubber rings, and frame.
5. Reinstall removed manhole frame and cover.

B. Replacing Manhole Frames and Covers:

1. Locate manholes for replacement of frames and covers as indicated on Drawings.
2. Remove existing manhole frames and covers to enable reuse.
3. Deliver removed manhole frames and covers to Owner as maintenance materials.
4. Install new frames and covers for manholes as indicated on Drawings.
5. Adjust new frames and covers to match finished grade as indicated on Drawings.
6. Seal joints between manholes and manhole frames.

C. Paving Restoration: Restore bituminous paving areas as specified in Section 32 12 16 "Asphalt Paving."

D. Landscaping Restoration: Restore grassed areas as specified in Sections 329119 "Landscape Grading" and 329219 "Seeding."

END OF SECTION

# PART 1 - GENERAL

## 1.1 SUMMARY

A. Section Includes:

1. Tied joint restraint system.

B. Related Requirements:

1. Section 31 23 16.13 - Trenching: Trenching and backfilling requirements for Site utilities.

## 1.2 REFERENCE STANDARDS

A. American Water Works Association:

1. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.

B. ASME International:

1. ASME B1.1 - Unified Inch Screw Threads, UN and UNR Thread Form.

C. ASTM International:

1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
4. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
5. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
6. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
7. ASTM A588/A588M - Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi Minimum Yield Point, with Atmospheric Corrosion Resistance.
8. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
9. ASTM F436 - Standard Specification for Hardened Steel Washers.

## 1.3 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Coordinate Work of this Section with installation of fittings and joints that require restraint.

1.4 PREINSTALLATION MEETINGS

A. Section 01 30 00 - Administrative Requirements: Requirements for preinstallation meeting.

B. Convene minimum one week prior to commencing Work of this Section.

1.5 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer catalog information for restrained joint details and installation instructions.

C. Shop Drawings:

1. Indicate restrained joint details and materials being used.
2. Submit layout drawings showing piece numbers and locations.
3. Indicate restrained joint locations.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Delegated Design Submittals:

1. Submit signed and sealed Shop Drawings with design calculations and assumptions for restrained lengths.
2. Submit joint restraint details.
3. Use joint restraint devices specifically designed for applications described in manufacturer information.

F. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.

G. Qualifications Statement:

1. Submit qualifications for manufacturer, fabricator, and licensed professional.

1.6 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of joint restraints.

1.7 QUALITY ASSURANCE

A. Maintain one copy of each standard affecting Work of this Section on Site.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

B. Fabricator: Company specializing in fabricating products specified in this Section with minimum three years' documented experience.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store materials according to manufacturer instructions.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN CRITERIA

A. Provide pressure pipeline with restrained joints at each bend, tee, and change in direction.

2.2 TIED JOINT RESTRAINT SYSTEMS

A. Manufacturers:

1. EBAA Iron Company
2. Star Pipe Products
3. Dresser
4. Substitutions: As specified in Section 01 60 00 - Product Requirements.

B. Tie Bolts:

1. Mechanical Joints on 2- and 3-Inch Pipe:

a. Size:5/8 inch.
b. Comply with ASTM A588/A588M, Grade B.
c. Comply with ASTM A325, Type 3, except increase tensile strength of full-body threaded section to 40,000 lb. minimum for 5/8 inch and 60,000 lb. minimum for 3/4 inch by heat-treating (quenching and tempering) to manufacturer's reheat and hardness specifications.

2. Mechanical and Flanged Joints on 4- to 12-Inch Pipe:

   a. Size: 3/4 inch.
   b. Comply with ASTM A588/A588M, Grade B.
   c. Comply with ASTM A325, Type 3, except increase tensile strength of full-body threaded section to 40,000 lb. minimum for 5/8 inch and 60,000 lb. minimum for 3/4 inch by heat-treating (quenching and tempering) to manufacturer's reheat and hardness specifications.

3. Mechanical Joints on 14- to 24-Inch Pipe:

   a. Size:3/4 inch.
   b. Comply with ASTM A588/A588M, Grade B and ASTM A325, Type 3.

4. Mechanical and Flanged Joints on 30-Inch and Larger Pipe:

   a. Size: 1 inch.
   b. Comply with ASTM A588/A588M, Grade B.
   c. Comply with ASTM A325, Type 3, except increase tensile strength of full-body threaded section to 100,000 lb. minimum by heat-treating (quenching and tempering) to manufacturers reheat and hardness specifications.

C. Tie Nut:

1. Description: Hex nut for each tie bolt and tie rods.
2. Comply with ASTM A563, Grade C3.
3. Finish: Plain, zinc plated, stainless steel, or galvanized.

D. Tiepin:

1. Bends and Hydrants: 3/4-inch round bar stock.
2. Size and Shape: 6-inch hairpin.
3. Comply with ASME B1.1 and ASTM A588/A588M.
4. Finish: Plain, zinc plated, stainless steel, or galvanized.

E. Tie Coupling:

1. Description: Extension of continuous-threaded rods.
2. Provide with center stop to aid installation.
3. Comply with ASTM A588/A588M.
4. Finish: Plain, zinc plated, stainless steel, or galvanized.

F. Tie Clamp:

1. Description: Retainer clamp for ductile iron, asbestos-cement, and PVC push-on pipe.
2. Location: In front of bell.
3. Comply with ASTM A36/A36M, ASTM A307, Grade A, and ASTM A563, Grade A.
4. Finish: Plain, zinc plated, stainless steel, or galvanized.

G. Tie Rod

1. Description: Continuous-threaded rod for cutting to desired lengths.

2. Comply with ASTM A588/A588M, Grade B, ASTM A325, Type 3, and ASME B1.1.
3. Finish: Plain, zinc plated, stainless steel, or galvanized.

H. Tie Bar:

1. Description: Steel bar used to restrain push-in plugs.
2. Comply with ASTM A36/A36M.
3. Finish: Plain, zinc plated, stainless steel, or galvanized.

I. Tie Washer:

1. Description: Round flat washers.
2. ASTM A588/A588M, ASTM F436, Type 1.
3. Finish: Plain, zinc plated, stainless steel, or galvanized.

## 2.3 MATERIALS

A. Steel:

1. High-Strength Low-Alloy Steel: Comply with ASTM A588/A588M, heat treated.
2. High-Strength Low-Alloy Steel: Comply with ASTM A588/A588M.
3. Carbon Steel: Comply with ASTM A36/A36M.

## 2.4 FINISHES

A. Zinc Plating:

1. Factory applied.
2. Comply with ASTM B633.

B. Galvanizing:

1. Comply with ASTM A123/.
2. Hot dip galvanize after fabrication.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that pipe and fittings are ready to receive Work.

C. Field measure and verify conditions for installation of Work.

3.2 PREPARATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Clean surfaces of pipe and fittings that are to receive tied joint restraint systems.

3.3 INSTALLATION

A. According to AWWA C600.

B. Install joint restraint system such that joints are mechanically locked together to prevent joint separation.

3.4 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.

B. Torque 5/8-inch nuts on mating threaded fasteners from 45 to 60 ft.-lbf.

C. Torque 3/4-inch nuts on mating threaded fasteners from 75 to 90 ft.-lbf.

D. Torque 1-inch nuts from 100 to 120 ft.-lbf.

END OF SECTION 33 05 09.33

# SECTION 33 05 33.16

# HDPE DRAINAGE PIPING

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes: HDPE drainage pipe.

B. Related Requirements:

1. Section 31 05 13 "Soils for Earthwork" for soils for backfill in trenches.
2. Section 31 05 16 "Aggregates for Earthwork" for aggregate for backfill in trenches.
3. Section 31 23 16 "Excavation" for product and execution requirements for excavation and backfill required by this Section.
4. Section 31 23 16.13 "Trenching" for execution requirements for trenching required by this Section.
5. Section 31 23 23 "Fill" for requirements for backfill to be placed by this Section.
6. Section 33 05 97 "Identification and Signage for Utilities" for plastic ribbon tape for placement above direct-buried utility.
7. Section 33 42 00 "Stormwater Conveyance" for stormwater drainage piping.

### 1.02 DEFINITIONS

A. Slow Crack Growth (SCG): A phenomenon by which a stress crack may form, comprised of a crack initiation phase and a crack propagation phase.

B. Slow Crack Growth (SCG) Resistance: The primary material property that relates quality and the critical component for assessing service life, measured using the notched, constant ligament-stress (NCLS) test per ASTM F2136.

C. Stress Crack: An external or internal fracture in plastic caused by tensile stresses less than its short-time mechanical strength.

D. Virgin Polyethylene (PE): A type of plastic material in the form of pellets, granules, powder, floc, or liquid that has not been subject to use or processing other than required for initial manufacture.

### 1.03 UNIT PRICES

A. Pipe and Fittings:

1. Basis of Measurement: By linear foot.

2. Basis of Payment: Includes excavating, hand trimming, removing soft subsoil, bedding and fill, pipe and fittings, accessories, and connecting to building service piping and to municipal storm drainage system.

1.04 SUBMITTALS

A. Product Data: HDPE drainage pipe.

B. Shop Drawings:

1. Indicate piping plans, elevations, sections, and connection details.
2. Include pipe elevations, invert elevations, pipe-to-pipe coupler connections, connections to stormwater detention structures, bedding, and cover materials.

1.05 QUALITY ASSURANCE

A. Manufacturers Qualifications: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

B. Fabricators Qualifications: Company specializing in fabricating products specified in this Section with minimum three years' documented experience.

C. Installers Qualifications: Company specializing in performing Work of this Section with minimum three years' documented experience and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's packaging; include installation instructions.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store HDPE piping according to manufacturer instructions.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.
3. Block individual and stockpiled pipe lengths to prevent moving.

1.07 FIELD CONDITIONS

A. Minimum Conditions: Do not install when temperature is below 32 degrees F.

B. Subsequent Conditions: Maintain during and after installation of HDPE piping.

PART 2 - PRODUCTS

2.01 HDPE DRAINAGE PIPE

A. Manufacturers:

1. Advanced Drainage Systems, Inc.
2. Crumpler Plastic Pipe, Inc.
3. JM Eagle; J-M Manufacturing Co., Inc.
4. Lane Enterprises Corporation.
5. Comply with AASHTO M294.
6. Interior: Smooth lined.
7. Joints:

    a. Comply with AASHTO M294.
    b. Interior: Match pipe.

2.02 MATERIALS

A. HDPE Resin Material Properties:

1. Provide material for pipe production from an engineered compound of virgin and recycled HDPE.
2. Conform with the minimum requirements of cell classification 424420C (Environmental Stress Crack Resistance (ESCR) Test Condition B) for 4- through 10-inch diameters, and 435420C (ESCR Test Condition B) for 12- through 60-inch diameters, as defined and described in the latest version of ASTM D3350, except that carbon black content should not exceed 4 percent.
3. Verify compatibility, as determined by design engineer, with overall system, including structural, hydraulic, material, and installation requirements for a given application.

B. HDPE Drainage Piping:

1. Comply with ASTM F667/F667M for applications where diameters of 8 to 24 inches are required and where loading conditions permit.
2. Comply with AASHTO M294, ASTM F2306/F2306M, and ASTM F2881/F2881M for applications where diameters of 12 to 60 inches are required and where loading conditions permit.
3. Select joint requirements to match pipe standards.
4. Corrugated PE Piping:

    a. Comply with ASTM F667/F667M.
    b. Profile Design: Single wall.
    c. Type: Corrugated outside and inside, corrugated outside with smooth interior and Perforated.
    d. Inside Nominal Diameter: As indicated on Drawings.
    e. Fittings: PE.
    f. Joint End Connections: Bell and spigot; comply with ASTM F667/F667M.

1) Bell-and-spigot joint performance designations relate to the ability of the system to control leakage and material infiltration.

a) Soil-Tight Joints: Prevent infiltration of soil particles larger than those passing a No. 200 sieve.

b) Silt-Tight Joints: Employ an elastomeric rubber seal and meet a laboratory pressure rating of at least 2 psi.

c) Water-Tight Joints: Gasketed connections meeting a 10.8 psi laboratory test per ASTM D3212.

g. Gaskets (Elastomeric Seals):

1) Comply with ASTM F477.
2) Cover gaskets with protective wrap to protect from debris during shipping and storage.
3) Provide installation of dual gaskets by pipe manufacturer.
4) Supply gasket manufacturer's joint lubricant for use on gaskets during pipe assembly.

C. Pipe Classifications:

1. Pipe offerings follow AASHTO M252 classification system for size, spacing, and placement of perforations.

a. Type S: Double-wall pipe with a smooth interior and corrugated exterior.
b. Type SP: Double-wall perforated pipe.
c. Type C: Single-wall pipe with a corrugated exterior and interior.
d. Type CP: Single-wall perforated pipe.
e. Class 1 Perforations: Subsurface drainage or combination storm and underdrain.

1) Specify Class 2 perforations for fully perforated pipe used for subsurface drainage only.

D. Plastic Underground Pipe Markers:

1. Manufacturers:

a. Kolbi Pipe Marker Co.
b. Marking Services, Inc.
c. Pipemarker.com; Brimar Industries, Inc.
d. Rhino Marking and Protection Systems.
e. Seton Identification Products; a Brady Corporation company.

2. Bury underground pipe marking tape over underground utility lines to warn excavators and to prevent damage, service interruption, and personal injury.
3. Tapes are printed on colors approved by American Public Works Association (APWA) to meet or exceed industry standards.

4. Provide 5-mil tape with aluminum backing to make it easy to find pipe underground using a nonferrous locator.
5. 1,000-foot-long rolls are available in 2-inch tape widths for maximum 12-inch depth; 3-inch tape widths for 12- to 18-inch depths; or 6-inch tape widths for maximum 24-inch depth.
6. Message reads "Caution Buried Pipeline Below" in black lettering on a yellow background.

E. Bedding and Cover:

1. Bedding: Fill Type A4, as specified in Section 310516 "Aggregates for Earthwork".
2. Cover: Fill Type S2, as specified in Section 310516 "Aggregates for Earthwork.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

A. Verify that trench cut and excavation base is ready to receive Work of this Section.

B. Verify that excavations, dimensions, and elevations are as indicated on Drawings.

C. Examine subgrades and conditions for compliance with requirements for installation.

D. Examine roughing-in of HDPE piping to verify locations of piping connections.

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

### 3.02 PREPARATION

A. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

B. Correct over-excavation with fine aggregate.

C. Remove large stones or other hard materials that could damage pipe or impede consistent backfilling or compaction.

D. Protect and support existing storm drainage lines, utilities, and appurtenances.

E. Utilities:

1. Maintain profiles of utilities.
2. Coordinate with other utilities to eliminate interference.
3. Notify Architect/Engineer if crossing conflicts occur.

### 3.03 INSTALLATION OF BURIED PIPING SYSTEMS

A. Verify connection to existing piping system size, location, and invert are as indicated on Drawings.

B. Establish elevations of buried piping with not less than 2 feet of cover.

C. Establish minimum separation of 2 feet from other services' piping according to local code.

D. Excavate pipe trench according to Section 312316 "Excavation" and 312316.13 "Trenching".

E. Install pipe to elevation as indicated on Drawings.

F. Place bedding material at trench bottom to provide uniform bedding for piping and level bedding materials in one continuous layer not exceeding 6 inches compacted depth; compact to 95 percent maximum density.

G. Install pipe on prepared bedding.

H. Route pipe in straight line.

## 3.04 INSTALLATION OF PIPING

A. Install HDPE pipe in accordance with ASTM D2321 and manufacturer's recommended installation guidelines.

1. Provide minimum cover for 4-inch to 48-inch diameters of at least 1 foot.
2. Provide minimum cover for 60-inch diameter pipe of at least 2 feet.

B. Installation Standards: Install Work according to ASTM D2321 standards.

C. Install plastic ribbon tape continuous 12” above pipeline; coordinate with Section 312323 "Fill" and 312316.13 "Trenching".

## 3.05 PROTECTION

A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

B. Cap open ends of piping during periods of Work stoppage.

END OF SECTION

# SECTION 33 05 61

# CONCRETE MANHOLES

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Concrete and masonry manholes.
2. Frames and covers.
3. Riser rings.
4. Pile support systems.

B. Related Requirements:

1. Section 03 10 00 "Concrete Forming and Accessories" for erection and bracing of forms.
2. Section 03 20 00 "Concrete Reinforcing" for reinforcing steel as required by this Section.
3. Section 03 30 00 "Cast-in-Place Concrete" for concrete type for manhole and structure foundation slab construction.
4. Section 31 05 13 "Soils for Earthwork" for soils for backfill in trenches.
5. Section 31 05 16 "Aggregates for Earthwork" for aggregate for backfill in trenches.
6. Section 31 05 19.13 "Geotextiles for Earthwork" for filter fabric for subsurface drainage.
7. Section 31 23 16 "Excavation" for excavating for manholes, structures, and foundation slabs.
8. Section 31 23 23 "Fill" for backfilling after manhole and structure installation.
9. Section 33 01 30.86 "Manhole Rim Adjustment" for resetting existing castings and grates.
10. Section 33 42 00 "Stormwater Conveyance" for piping connections to manholes and structures.

### 1.02 DEFINITIONS

A. Bedding: A type of specialized material placed under manhole prior to installation and subsequent backfill operations.

### 1.03 UNIT PRICES

A. Manholes:

1. Basis of Measurement: By each manhole.
2. Basis of Payment: Includes excavating, concrete foundation slab, concrete structure sections, masonry transition to cover frame, cover frame and cover, to indicated depth, and forming and sealing of pipe inlets and outlets.

1.04 SUBMITTALS

A. Product Data:

1. Concrete and masonry manholes.
2. Frames and covers.
3. Riser rings.

B. Shop Drawings:

1. Indicate structure locations and elevations.
2. Indicate sizes and elevations of piping, conduit, and penetrations.

C. Source Quality-Control Reports: For manholes and covers.

D. Field Quality-Control Reports: For manholes and covers.

E. Qualifications Statement: For manufacturer.

1.05 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of manholes and connections, and record invert elevations.

1.06 QUALITY ASSURANCE

A. Manufacturers Qualifications: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

B. Handling: Comply with precast concrete manufacturer instructions and ASTM C913 for unloading and moving precast manholes and drainage structures.

C. Storage:

1. Store materials according to manufacturer instructions.
2. Store precast concrete manholes and drainage structures to prevent damage to Owner's property or other public or private property.
3. Repair property damaged from materials storage.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.

2. Provide additional protection according to manufacturer instructions.

1.08 FIELD CONDITIONS

A. Maintain materials and surrounding air temperature to minimum 50 degrees F prior to, during, and 48 hours after completion of masonry Work.

B. Cold Weather Requirements: Comply with ACI 530/530.1.

1.09 WARRANTY

A. Furnish five-year manufacturer's warranty for concrete manholes.

PART 2 - PRODUCTS

2.01 CONCRETE AND MASONRY MANHOLES

A. Manufacturers:

1. Binghamton Precast.
2. Fort Miller Company.
3. Substitutions: Section 01 60 00 - Product Requirements.

B. Reinforced Precast Concrete Manhole Sections:

1. Comply with ASTM C478.
2. Gaskets: Comply with ASTM C923.
3. Joints:

a. Comply with ASTM C913.
b. Maximum Leakage: 0.025 gal. per hour per foot of joint at 3 feet of head.

C. Reinforced Cast-in-Place Concrete Manhole Sections: As specified in Section 033000 "Cast-in-Place Concrete".

D. Shaft and Eccentric Cone Top Sections:

1. Pipe Sections: Reinforced precast concrete.
2. Joints:

a. Lipped male/female.
b. Dry.

3. Sleeved to receive pipe and conduit sections.

E. Shape: Cylindrical.

F. Clear Inside Dimensions:

1. Diameter: 48 inches.

2. As indicated on Drawings.

G. Design Depth:

1. As indicated on Drawings.

H. Clear Cover Opening:

1. Diameter: 26 inches.
2. As indicated on Drawings.

I. Pipe Entry: Furnish openings as indicated on Drawings.

J. Structure Joint Gaskets:

1. Comply with ASTM C361.
2. Material: Rubber.

2.02 FRAMES AND COVERS

A. Manufacturers:

1. EJ.
2. Neenah Foundry Company.
3. Substitutions: Section 01 60 00 - Product Requirements.

B. Cast iron.

C. Comply with ASTM A48/A48M, Class 30B and AASHTO M306.

D. Lid:

1. Bearing Surface: Machined flat.
2. Configuration: Removable.

E. Cover Design: Closed or Open checkerboard grille as indicated on Drawings.

F. Live-Load Rating: HS-20 psf.

G. Cover: Molded with identifying name.

H. Grate: Bicycle safe.

I. Nominal Lid or Grate Size: As indicated on Drawings.

2.03 RISER RINGS

A. Manufacturers:

1. EJ.
2. Neenah Foundry Company.
3. Substitutions: Section 01 60 00 - Product Requirements.

B. Riser Rings:

1. Thickness of 4 to 6 Inches (100 to 150 mm):

a. Precast concrete.
b. Comply with ASTM C478.

2. Thickness Less Than 4 Inches (100 mm):

a. Cast iron.
b. Comply with AASHTO M306.

3. Rubber Seal Wraps:

a. Wraps and Band Widths: Comply with ASTM C877, Type III.
b. Cone/Riser Ring Joint: Minimum 3-inch overlap.
c. Frame/Riser Ring Joint: 2-inch overlap.
d. Additional Bands: Overlap upper band by 2 inches.

2.04 MATERIALS

A. Cover and Bedding:

1. Bedding: Fill Type A4, as specified in Section 310516 "Aggregates for Earthwork".
2. Cover: Fill Type A4, as specified in Section 310516 "Aggregates for Earthwork".

2.05 ACCESSORIES

A. Steps:
1. Rungs: Formed galvanized steel.
2. Fabrication: Formed integral with manhole sections.
3. Diameter: 3/4 inch.
4. Width:

a. 12 inches.

5. Spacing:

a. 16 inches o.c. vertically, set into structure wall.

B. Joint Sealant: Comply with ASTM C990.

C. Geotextile Filter Fabric:

1. As specified in Section 31 05 19.13 "Geotextiles for Earthwork."

2. Non-biodegradable; nonwoven.
3. Comply with AASHTO M288.
4. Class: A.

D. Concrete: As specified in Section 033000 "Cast-in-Place Concrete".

E. Grout: As specified in Section 033000 "Cast-in-Place Concrete".

F. Watertight PE Manhole Insert:

1. Manufacturers:

a. Parson Environmental Products, Inc.

G. Expandable Pipe Plug:

1. Manufacturers:

a. Petersen Products Co.
b. Taylor Made Plastics Inc. (TMP).

H. Soil Backfill from Above Pipe to Finish Grade:

1. Soil Type S1, as specified in Section 310513 "Soils for Earthwork".
2. Subsoil: No frozen earth, or foreign matter, or rocks more than 6 inches in diameter.

## 2.06 FINISHES

A. Bituminous Interior Manhole Coating:

1. Manufacturers:

a. Polyglass U.S.A., Inc.

B. Steel Galvanizing:

1. Hot-dip galvanize after fabrication.
2. Comply with ASTM A123/A123M.

PART 3 - EXECUTION

3.01 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 ground areas for suitable conditions where concrete manholes will be installed.

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

3.02 PREPARATION

A. Mark each precast structure by indentation or waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers as indicated on Drawings to indicate its intended use.

B. Coordinate placement of inlet and outlet pipe or duct sleeves as required by other Sections.

C. Do not install manholes and structures where Site conditions induce loads exceeding structural capacity of manholes or structures.

D. Inspect precast concrete manholes and structures immediately prior to placement in excavation to verify that they are internally clean and free from damage; remove and replace damaged units.

3.03 INSTALLATION OF CONCRETE MANHOLES

A. Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface structures or utilities in immediate or adjacent areas.

B. Correct over-excavation with fine aggregate.

C. Remove large stones or other hard matter impeding consistent backfilling or compaction.

D. Protect manhole from damage or displacement while backfilling operation is in progress.

E. Excavating:

1. As specified in Section 312316 "Excavation" and in indicated locations and depths.
2. Provide clearance around sidewalls of manhole or structure for construction operations, granular backfill, and placement of geotextile filter fabric.
3. If ground water is encountered, prevent accumulation of water in excavations; place manhole or structure in dry trench.
4. Where possibility exists of watertight manhole or structure becoming buoyant in flooded excavation, anchor manhole or structure to avoid flotation as approved by Engineer.

F. Base and Alignment:

1. Place foundation slab and trowel top surface level.
2. Grout base of shaft sections to achieve slope to exit piping, trowel smooth, and contour to form continuous drainage channel as indicated on Drawings.
3. Place manhole sections plumb and level, trim to correct elevations, and anchor to foundation slab.
4. Install manholes supported at proper grade and alignment on compacted crushed-stone bedding support system as indicated on Drawings.
5. Grout base of shaft sections to achieve slope to exit piping, trowel smooth, and contour to form continuous drainage channel as indicated on Drawings.
6. Form and place manhole or structure cylinders plumb and level, to correct dimensions and elevations.

G. Attachments:

1. As Work progresses, build fabricated metal items.
2. Cut and fit for pipe conduit and sleeves.
3. Set cover frames and covers level to correct elevations without tipping.

H. Backfilling: As specified in Section 310513 "Soils for Earthwork.", 310516 "Aggregates for Earthwork.", and 312323 "Fill."

I. Coating: Paint interior with two coats of bituminous interior coating at rate of 120 sq. ft./gal. for each coat.

J. Precast Concrete Manholes:

1. Lift precast components at lifting points designated by manufacturer.
2. When lowering manholes and structures into excavations and joining pipe to units, take precautions to ensure that interior of pipeline and structure remains clean.
3. Assembly:

    a. Assemble multi section manholes and structures by lowering each section into excavation.
    b. Install rubber gasket joints between precast sections according to manufacturer recommendations.
    c. Lower, set level, and firmly position base section before placing additional sections.

4. Remove foreign materials from joint surfaces and verify that sealing materials are placed properly.
5. Maintain alignment between sections by using guide devices affixed to lower section.
6. Joint sealing materials may be installed on Site or at manufacturer's plant.
7. Verify that installed manholes and structures meet required alignment and grade.
8. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe; fill annular spaces with mortar.
9. Cut pipe flush with interior of structure.
10. Shape inverts through manhole and structures as indicated on Drawings.

K. Castings:

1. Set frames using mortar and masonry as indicated on Drawings.
2. Install radially laid concrete brick with 1/4-inch- thick, vertical joints at inside perimeter.
3. Lay concrete brick in full bed of mortar and completely fill joints.
4. If more than one course of concrete brick is required, stagger vertical joints.
5. Set frame and cover 2 inches above finished grade for manholes and other structures with covers located within unpaved areas to allow area to be graded away from cover beginning 1 inch below top surface of frame.

## 3.04 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Cast-in-Place Concrete: As specified in Section 033000 "Cast-in-Place Concrete".
2. Concrete manholes will be considered defective if it does not pass tests and inspections.

B. Prepare test and inspection reports.

## 3.05 ADJUSTING

A. Vertical Adjustment of Existing Manholes and Structures:

1. As specified in Section 330130.86 "Manhole Rim Adjustment".
2. If required, adjust top elevation of existing manholes and structures to finished grades as indicated on Drawings.
3. Frames, Grates, and Covers:

    a. Remove frames, grates, and covers cleaned of mortar fragments.
    b. Reset to required elevation according to requirements specified for installation of castings.

4. Reinforcing Bars:

    a. Remove concrete without damaging existing vertical reinforcing bars if removal of existing concrete wall is required.
    b. Clean vertical bars of concrete and bend into new concrete top slab or splice to required vertical reinforcement as indicated on Drawings.

5. Clean and apply sand-cement bonding compound on existing concrete surfaces to receive cast-in-place concrete as specified in Section 033000 "Cast-in-Place Concrete".

END OF SECTION

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. PE manholes.
2. Frames and covers.

B. Related Requirements:

1. Section 31 05 13 "Soils for Earthwork" for soils for backfill in trenches.
2. Section 31 05 16 "Aggregates for Earthwork" for bedding fill type.
3. Section 31 05 19.13 "Geotextiles for Earthwork" for filter fabric for subsurface drainage.
4. Section 31 23 16 "Excavation" for excavating for manholes, structures, and foundation slabs.
5. Section 31 23 23 "Fill" for backfilling after manhole installation.
6. Section 33 42 00 "Stormwater Conveyance" for piping connections to manholes and structures.

### 1.2 DEFINITIONS

A. Bedding: Specialized material placed under manhole prior to installation and subsequent backfill operations.

B. HDPE: High-density polyethylene.

### 1.3 SUBMITTALS

A. Product Data:

1. PE manholes.
2. Frames and covers.

B. Shop Drawings:

1. Indicate structure locations and elevations.
2. Indicate sizes and elevations of piping, penetrations.

C. Source Quality-Control Reports: For PE manholes, frames, and covers.

D. Field Quality-Control Reports: For PE manholes, frames, and covers.

E. Qualifications Statement: For manufacturer.

### 1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of manholes and connections, and record invert elevations.

### 1.5 QUALITY ASSURANCE

A. Manufacturers Qualifications: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

B. Handling: Comply with manhole manufacturer instructions for unloading, and moving precast manholes and drainage structures.

C. Storage:

1. Store materials according to manufacturer instructions.
2. Store manholes to prevent damage to Owner's property or other public or private property.
3. Repair property damaged from materials storage.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Take precautions to prevent damage to interior or exterior surfaces when handling.
3. Provide additional protection according to manufacturer instructions.

## 1.7 WARRANTY

A. Furnish five-year manufacturer's warranty for PE manholes.

# PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

A. Perform Work according to:

1. NYSDOT standards.

## 2.2 PE MANHOLES

A. Manufacturers:

1. Industrial Pipe Fittings, LLC.
2. ISCO Industries, LLC.
3. Plastic Fusion Fabricators, Inc.
4. Rhino USA of Oregon LLC.
5. ADS.

B. Material:

1. HDPE.
2. Type: 3408.
3. Comply with ASTM D3350.
4. Minimum Cell Classification: 345464 C.

C. Nominal Outer Diameter: As indicated on Drawings.

## 2.3 FRAMES AND COVERS

A. Manufacturers:

1. EJ.
2. Neenah Foundry Company.
3. ADS.

B. Material:

1. Ductile iron.
2. Comply with ASTM A48/A48M, Class 30B AASHTO M306 ASTM A536.
3. Other approved equal.

C. Lid:

1. Bearing Surface: Machined flat.
2. Configuration: Removable.
3. Security: None.

D. Cover Design: Bicycle safe.

E. Loading: Non-traffic.

F. Furnish sealing gasket.

G. Identification: Cast with identifying name and logo.

H. Grate: Bicycle safe.

## 2.4 MATERIALS

A. Bedding: Fill Type A4, as specified in Section 31 05 16 "Aggregates for Earthwork".

# 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 PE manholes to verify actual locations of piping connections before installation.

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

## 3.2 INSTALLATION OF PE MANHOLES

A. Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface structures or utilities in immediate or adjacent areas.

B. Correct over-excavation with fine aggregate.

C. Remove large stones or other hard matter impeding consistent backfilling or compaction.

D. Protect manhole from damage or displacement while backfilling operation is in progress.

E. Excavating:

1. As specified in Section 31 23 16 "Excavation" and in indicated locations and depths.
2. Provide clearance around sidewalls of manhole for construction operations, granular backfill, and placement of geotextile filter fabric.
3. If ground water is encountered, prevent accumulation of water in excavations; place manhole in dry trench.
4. Where possibility exists of watertight manhole becoming buoyant in flooded excavation, anchor manhole to avoid flotation as approved by Architect/Engineer.

F. Bedding:

1. Place bedding material at trench bottom, and level materials in continuous layer not exceeding 6 inches.
2. Compact bedding material to 95 percent maximum density.
3. Maintain optimum moisture content of bedding material to attain required compaction density.

G. Backfilling: As specified in Section 31 05 13 "Soils for Earthwork." 310516 "Aggregates for Earthwork." 312323 "Fill."

END OF SECTION

SECTION 33 05 97

IDENTIFICATION AND SIGNAGE FOR UTILITIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Pipeline marker posts.
2. Utility markers.
3. Marking flags.
4. Ribbon tape.
5. Trace wire.

B. Related Requirements:

1. Section 31 23 16.13 "Trenching" for backfilling considerations for installation of underground pipe markers.
2. Section 31 23 23 "Fill" for backfilling considerations for installation of underground pipe markers.
3. Section 33 42 00 "Stormwater Conveyance" for piping, valves, and appurtenances requiring identification marking.

1.02 SUBMITTALS

A. Product Data:

1. Ribbon tape.
2. Trace wire.

B. Samples: Submit one pipeline marker post, utility marker, marking flag, 10 feet of ribbon tape, and 10 feet of trace wire.

C. Qualifications Statement: For manufacturer.

1.03 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of tagged valves.

1.04 QUALITY ASSURANCE

A. Manufacturers Qualifications: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

PART 2 - PRODUCTS

2.01 RIBBON TAPE

A. Manufacturers:

1. Berntsen International Inc.
2. Pipemarker.com; Brimar Industries, Inc.

B. Description:

1. Material: PE.
2. Brightly colored, continuously printed.
3. Minimum Size: 6 inches wide by 4 mils thick.
4. Manufactured for direct burial service.

2.02 TRACE WIRE

A. Manufacturers:

1. Northtown Company.
2. Priority Wire and Cable, Inc.
3. TracerWire.
4. Conductor: Magnetically detectable.
5. Wire: Unshielded 10-AWG Type THWN insulated copper.

PART 3 - EXECUTION

3.01 INSTALLATION OF IDENTIFICATION AND SIGNAGE FOR UTILITIES

A. Ribbon Tape or Trace Wire:

1. Continuous 12” over top of pipe.
2. If multiple pipes occur in common trench, locate tape and wire above centerline of trench.
3. Coordinate with trench Work as specified in Section 312316.13 "Trenching" and 312323 "Fill".

END OF SECTION

# PART 1 - GENERAL

## 1.1 SUMMARY

A. Section Includes:

1. Valves.
2. Valve boxes.

B. Related Requirements:

1. Section 03 30 00 - Cast-in-Place Concrete
2. Section 31 05 16 - Aggregates for Earthwork.
3. Section 33 01 10.58 - Disinfection of Water Utility Piping Systems.
4. Section 33 14 13 - Public Water Utility Distribution Piping

## 1.2 REFERENCE STANDARDS

A. American Water Works Association:

1. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service.
2. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service.
3. AWWA C550 - Protective Interior Coatings for Valves and Hydrants.
4. AWWA C600 – Installation of Ductile Iron.

B. NSF International:

1. NSF 61 - Drinking Water System Components - Health Effects.

## 1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer information regarding component materials, fittings, assembly and parts diagram, and accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.

## 1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of valves.

C. All survey operations shall be completed by a licensed and registered New York State Professional Land Surveyor.

D. Provide operation maintenance data for valves.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for maintenance materials.

B. Tools: Furnish one tee wrench of required length to Owner.

1.6 QUALITY ASSURANCE

A. Maintain one copy of each standard affecting Work of this Section on Site.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

B. Installer: Company specializing in performing Work of this Section with minimum three years' documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Delivery:

1. Seal valve and hydrant ends to prevent entry of foreign matter.
2. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store materials according to manufacturer instructions.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

PART 2 - PRODUCTS

A. Resilient-Wedge Gate Valves:

1. Manufacturers:

    a. Mueller Co.
    b. Clow Eddy – Iowa.
    c. American Flow Control.
    d. Substitutions: As specified in Section 01 60 00 - Product Requirements.
    e. Furnish materials according to City of Norwich and City of Norwich Fire Department Standards.

2. Description:

    a. Comply with AWWA C509.
    b. Body: Ductile iron bronze on iron body.
    c. Seats: Resilient.
    d. Stem:

        1) Type: Non-rising.
        2) Material: Bronze.

    e. Operation:

        1) Square operating nut.
        2) Opening Direction: Counterclockwise.

    f. Ends:

        1) Flanged, mechanical joint or bell end connections.

    g. Coating:

        1) AWWA C550; Interior/Exterior.

    h. Pressure Rating:

        1) 12-inch Diameter and Smaller: 200 PSIG.

        2) 14-inch Diameter and Smaller: 150 PSIG

## 2.2 VALVE BOXES

A. Description:

1. 12-inch Diameter Valves and Smaller:

    a. Material: Cast iron.
    b. Type: Two piece; screw.

2. Valves Larger than 12-inch Diameter:

    a. Material: Cast iron.
    b. Type: Three piece; screw.

c. Base: Round.

3. Lid Inscription: WATER Cast Iron.

2.3 ACCESSORIES

A. Concrete for Thrust Restraints: As specified in Section 03 30 00.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Determine exact location and size of valves from Drawings.

C. Identify required lines, levels, contours, and datum locations.

D. Verify that elevations of existing facilities prior to excavation and installation of valves are as indicated on Drawings.

3.2 PREPARATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Locate, identify, and protect from damage utilities to remain.

C. Do not interrupt existing utilities without permission and without making arrangements to provide temporary utility services.

1. Notify Architect/Engineer not less than 3 days in advance of proposed utility interruption.
2. Do not proceed without written permission from Architect/Engineer.

3.3 INSTALLATION

A. Perform trench excavation, backfilling, and compaction as specified in Section 33 14 17 - Site Water Service Utility Laterals.

B. Install valves in conjunction with pipe laying.

C. Provide buried valves with valve boxes installed flush with finished grade.

D. Orientation:

1. Set valves plumb.

E. Disinfection of Water Piping System: Flush and disinfect valves with water mains as specified in Section 33 01 10.58 - Disinfection of Water Utility Piping Systems.

3.4 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Perform pressure test on domestic water distribution system in accordance with AWWA C600.

1. When test of pipe indicates leakage greater than allowed locate source of leakage, make corrections and retest until leakage is within allowable limits. Correct visible leakage regardless of quantity of leakage.

END OF SECTION 33 14 19

SECTION 33 42 00

STORMWATER CONVEYANCE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Storm drainage piping.
2. Manholes.
3. Catch basins.
4. Cleanouts.
5. Pile support systems.
6. Concrete encasement and cradles.

B. Related Requirements:

1. Section 03 20 00 "Concrete Reinforcing" for reinforcement of concrete cradles.
2. Section 03 30 00 "Cast-in-Place Concrete" for concrete type for catch basin base pad construction.
3. Section 31 05 13 "Soils for Earthwork" for soils for backfill in trenches.
4. Section 31 05 16 "Aggregates for Earthwork" for aggregate for backfill in trenches.
5. Section 31 05 19.13 "Geotextiles for Earthwork" for geotextile filter fabric.
6. Section 31 23 16 "Excavation" for product and execution requirements for excavation and backfill as required by this Section.
7. Section 31 23 16.13 "Trenching" for execution requirements for trenching as required by this Section.
8. Section 31 23 23 "Fill" for requirements for backfill to be placed under this Section.
9. Section 33 05 61 "Concrete Manholes" for manholes and accessories as required by this Section.

1.02 DEFINITIONS

A. ABS: Acrylonitrile butadiene styrene.

1.03 UNIT PRICES

A. Pipe and Fittings:

1. Basis of Measurement: By linear foot.
2. Basis of Payment: Includes excavating, hand trimming, removing soft subsoil, bedding and fill, geotextile fabric, pipe and fittings, accessories, and connecting to building service piping and to municipal sewer.

B. Catch Basin and Cleanout:

1. Basis of Measurement: By each unit for depth as indicated on Drawings.
2. Basis of Payment: Includes excavating, bedding and fill, hand trimming, foundation pad, unit installation with accessories, and connecting to sewer piping.

1.04 COORDINATION

A. Coordinate Work of this Section with termination of storm sewer connection outside building, trenching, connection to foundation drainage system and municipal sewer utility service.

1.05 SUBMITTALS

A. Product Data:

1. Storm drainage piping.
2. Manholes.
3. Catch basins.
4. Cleanouts.
5. Pile support systems.
6. Concrete encasement and cradles.

B. Field Quality-Control Reports: For storm drainage piping, manholes, catch basins, cleanouts, pile support systems, and concrete encasement and cradles.

C. Qualifications Statement: For manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturers Qualifications: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

B. Store materials according to manufacturer instructions.

C. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

PART 2 - PRODUCTS

2.01 STORM DRAINAGE PIPING

A. PVC Piping:

1. Pipe:

a. Comply with ASTM D2680; SDR 35.
b. Inside Nominal Diameter: As indicated on Drawings.
c. Style: Bell and spigot with rubber-ring sealed gasket joint.

2. Fittings: PVC.
3. Joints:

a. Comply with ASTM F477.
b. Gaskets: Elastomeric.

B. Corrugated PE Piping for 3- to 6-Inch (25- to 75-mm) or 3- to 10-Inch (25- to 250-mm) Diameters:

1. Pipe:

a. Comply with ASTM F667.
b. Type: Perforated or Smooth interior.
c. Inside Nominal Diameter: As indicated on Drawings.

2. Fittings: PE.
3. Joints: Comply with ASTM F667.

C. Corrugated PE Piping for 8- to 24-Inch (200- to 600-mm) or 12- to 60-Inch (300- to 1 500-mm) Diameters:

1. Pipe:

a. Comply with ASTM F667.
b. Type: Smooth interior.
c. Inside Nominal Diameter: As indicated on Drawings.

2. Fittings: PE.
3. Joints: Comply with ASTM F667.

2.02 MANHOLES

A. As specified in Section 330561 "Concrete Manholes."

2.03 CATCH BASINS

A. Shaft and Top Section:

1. Material: Reinforced precast cast-in-place concrete pipe sections.
2. Joints: Lipped male/female.
3. Nominal Shaft Diameter: As indicated on Drawings.
4. Top Section: Concentric cone.

B. Lids and Frames:

1. Manufacturers:

a. EJ.
b. Neenah Foundry Company.
c. Polylok, Inc.
d. Approved Equal

2. Materials: Cast iron.
3. Lid:

a. Bicycle safe grate.

4. Nominal Lid and Frame Size: As indicated on Drawings.

C. Base Pad:

1. Material: Cast-in-place concrete, as specified in Section 033000 "Cast-in-Place Concrete".

2.04 CONCRETE ENCASEMENT AND CRADLES

A. Concrete:

1. Description: Reinforced concrete, as specified in Section 03 30 00 "Cast-in-Place Concrete."
2. Compressive Strength: 4,000 psi at 28 days, reinforced concrete, air-entrained rough troweled finish.

B. Reinforcement: As specified in Section 03 20 00 "Concrete Reinforcing."

2.05 MATERIALS

A. Bedding and Cover:

1. Bedding: Fill Type A4, as specified in Section 310516 "Aggregates for Earthwork".
2. Cover: Fill Type A4, as specified in Section 310516 "Aggregates for Earthwork".
3. Soil Backfill from above Pipe to Finish Grade: Soil Type S3 as specified in Section 310513 "Soils for Earthwork".
4. Subsoil: No rocks more than 6 inches in diameter, frozen earth, or foreign matter.

2.06 ACCESSORIES

A. Geotextile Filter Fabric:

1. As specified in Section 31 05 19.13 "Geotextiles for Earthwork."
2. Comply with AASHTO M288 for subsurface drainage.
3. Type:

a. Class A, non-biodegradable.
b. Non-woven.

B. Underground Pipe Markers: As specified in Section 33 05 97 "Identification and Signage for Utilities."

C. Pipe Support Brackets: Galvanized structural steel coated with bituminous paint.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that excavation base is ready to receive Work of this Section.

B. Verify that excavations, dimensions, and elevations are as indicated on Drawings.

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

3.02 PREPARATION

A. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

B. Correct over-excavation with fine aggregate.

C. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

3.03 INSTALLATION OF STORM DRAINAGE PIPING, CATCH BASINS, AND CLEANOUTS

A. Excavation and Bedding:

1. Excavate trench to 6 inches below pipe invert, and as specified in Section 312316 "Excavation." and 312316.13 "Trenching."
2. Hand trim excavation for accurate placement of piping to indicated elevations.
3. Place bedding material at trench bottom.
4. Level materials in continuous layers not exceeding 6-inch compacted depth.

5. Maintain optimum moisture content of bedding material to attain required compaction density.
6. Level fill materials in continuous layers not exceeding 6 inches in depth, and compact to 95 percent maximum density.

7. Install pipe on compacted subgrade meeting bedding requirements, and cradle bottom 20 percent of diameter.
8. Place geotextile fabric over compacted bedding.

B. Piping:

1. Pipe, Fittings, and Accessories: Comply with ASTM D2321.
2. Seal joints watertight.
3. Place pipe on minimum 6-inch-deep bed of Type A filter aggregate.
4. Cradle bottom 20 percent of pipe diameter to avoid point load.
5. Install aggregate at sides and over top of pipe.
6. Install top cover to minimum compacted thickness of 12 inches, and compact to 95 percent maximum density.
7. Backfilling and Compaction:

    a. As specified in Section 312323 "Fill".
    b. Do not displace or damage pipe while compacting.

8. Manholes: As specified in Section 330561 "Concrete Manholes."
9. Pipe Markers: As specified in Section 33 05 97 "Identification and Signage for Utilities."
10. Install Site storm drainage system piping to within 5 feet of building.

C. Catch Basins and Cleanouts:

1. Form bottom of excavation clean and smooth, and to indicated elevation.
2. Form and place cast-in-place concrete base pad, with provision for storm sewer pipe end sections.
3. Level top surface of base pad.
4. Sleeve concrete shaft sections to receive storm sewer pipe sections.
5. Establish elevations and pipe inverts for inlets and outlets as indicated on Drawings.
6. Mount lid and frame level in grout, secured to top section to indicated elevation.

## 3.04 TOLERANCES

A. Maximum Variation from Indicated Pipe Slope: 1/8 inch in 10 feet.

## 3.05 FIELD QUALITY CONTROL

A. Request inspection by Engineer prior to and immediately after placing aggregate cover over pipe.

B. Testing:

1. Pipe Welding: Comply with AASHTO T241.

2. Compaction Test:
   a. Comply with ASTM D1557.
   b. Testing Frequency: One test per 50 linear feet per lift.

3. Manholes: As specified in Section 330561 "Concrete Manholes."

4. Piping:

   a. Infiltration and Exfiltration Testing: As specified in Section 330505.33 "Infiltration and Exfiltration Testing".

5. If tests indicate that Work does not meet specified requirements, remove Work, replace, and retest.

C. Prepare test and inspection reports.

3.06 PROTECTION

A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 33 42 36

STORMWATER TRENCH DRAINS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Trench drains.

B. Related Requirements:

1. Section 31 05 13 "Soils for Earthwork" for soil for backfill.
2. Section 31 05 16 "Aggregates for Earthwork" for aggregate for backfill.
3. Section 31 23 16 "Excavation" for excavating for trench drains.
4. Section 31 23 23 "Fill" for backfilling after trench drain installation.
5. Section 33 42 00 "Stormwater Conveyance" for connection to stormwater collection system.

1.02 UNIT PRICES

A. Trench Drains:

1. Basis of Measurement: By each.
2. Basis of Payment: Includes excavation, bedding, channel drain, channel grate, specified accessories, installation, and backfilling.

1.03 SUBMITTALS

A. Product Data: Trench drains.

B. Shop Drawings:

1. Indicate critical dimensions, installation and anchoring requirements, and other details.
2. Signed and sealed by the qualified professional engineer responsible for their preparation.

C. Source Quality-Control Reports: For trench drains.

D. Field Quality-Control Reports: For trench drains.

E. Qualifications Statement: For manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturers Qualifications: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

B. Store products according to manufacturer instructions.

C. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.06 WARRANTY

A. Furnish five-year manufacturer's warranty for trench drains.

PART 2 - PRODUCTS

2.01 TRENCH DRAINS

A. Performance Design Criteria

1. Loading:

a. H-20, according to AASHTO HB-17.

B. Channel Drains:

1. Material: Concrete.
2. Built-in Slope: 0.7 percent.
3. Width: 12 inches.
4. ID: 4 inches.
5. Bottom Radius: 2 inches.
6. Channel Section Length: 4 feet.
7. End Connections: Tongue and groove.
8. Bottom Outlet: Molded.

C. Channel Grates:

1. Material: Cast iron.
2. Grate Openings: Bicycle Safe.
3. Color: Black.

D. Accessories:

1. Grate lock.
2. End cap and screws.

3. End outlet.

4. Bottom outlet adapter.

2.02 MATERIALS

A. Bedding and Backfill:

1. Bedding: Fill Type A4, as specified in Section 310516 "Aggregates for Earthwork".
2. Backfill: Soil Type S3, as specified in Section 310513 "Soils for Earthwork".
3. Subsoil: No rocks more than 6 inches in diameter, frozen earth, or foreign matter.

PART 3 - EXECUTION

3.01 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. Verify that excavation is ready to receive trench drains.

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

3.02 PREPARATION

A. Do not install trench drains if Site conditions induce loads exceeding structural capacity of trench drains.

3.03 INSTALLATION OF TRENCH DRAINS

A. Excavation:

1. As specified in Section 31 23 16 "Excavation" at location and to depth as indicated on Drawings.
2. Provide clearance around sidewalls of structure for construction operations.
3. If groundwater is encountered, prevent accumulation of water in excavations, place trench drains in dry trench.

B. Place trench drain sections plumb and level, to elevations as indicated on Drawings, and according to manufacturer instructions.

C. Backfilling: As specified in Section 312316 "Excavation." and 312323 "Fill."

3.04 FIELD QUALITY CONTROL

A. Inspection:

1. Inspect trench drains immediately prior to placement in excavation to verify that trench drains are internally clean and free from damage.
2. Remove and replace damaged sections.
3. Verify alignment of gate and components.
4. Verify that gate operates smoothly and does not bind or scrape.

B. Prepare test and inspection reports.

3.05 DEMONSTRATION

A. Demonstrate routine maintenance and emergency repair procedures to Owner's personnel.

B. Equipment Acceptance:

1. Adjust, repair, modify, or replace components failing to perform as specified and rerun tests.
2. Make final adjustments to equipment under direction of manufacturer's representative.

END OF SECTION

SECTION 40 05 81.26

FREEZE-PROOF YARD HYDRANTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Non-freeze yard hydrants.

B. Related Requirements:

1. Section 33 01 10.58 "Disinfection of Water Utility Piping Systems" for requirements for flushing and disinfecting.

1.02 UNIT PRICES

A. Non-freeze Yard Hydrants:

1. Basis of Measurement: By each.
2. Basis of Payment: Includes non-freeze yard hydrant assembly and installation.

1.03 COORDINATION

A. Coordinate Work of this Section with installation of water mains.

1.04 SUBMITTALS

A. Product Data: Freeze-proof hydrants.

B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

C. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.

D. Field Quality-Control Reports: For freeze-proof hydrants.

E. Qualifications Statement: For manufacturer.

F. Record Documents: Record actual locations of non-freeze yard hydrants.

1.05 MAINTENANCE MATERIAL SUBMITTALS

A. Tools: Furnish one tee wrench of required length to Owner.

1.06 QUALITY ASSURANCE

A. Materials in Contact with Potable Water: Certified according to NSF 61 and NSF 372.

B. Manufacturers Qualifications: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Delivery:

1. Seal hydrant ends to prevent entry of foreign matter.
2. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

B. Store materials according to manufacturer instructions.

C. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

PART 2 - PRODUCTS

2.01 NON-FREEZE YARD HYDRANTS

A. Manufacturers:

1. Josam Company.
2. Zurn Industries, LLC.
3. Substitutions: Section 01 60 00 - Product Requirements.

B. Non-freeze type.

C. Closure Valve: Free-floating, compression type.

D. Barrel: Automatic drain after use.

E. Nourishing stem.

F. Main Valve: 1-1/2 inches.

G. Lubrication: Furnish access hole in operating nut.

H. Materials:

1. Body: Galvanized steel.
2. Head: Cast iron or Galvanized steel.
3. Outlets: Brass.
4. Main Valve: Bronze.
5. Drain Valve: Bronze.
6. Operating Rod: Stainless steel.

I. Operation:

1. Operating nut.
2. Drain Valve: Actuated when main valve is in CLOSED position.

J. Connections:

1. Hose Connection: One each, 1 inch hose connections, with threaded quick-disconnect adapters.
2. Drain Port: 1/2 inch.
3. Inlet:

a. Size: 3/4 inch.
b. Type: Threaded.

K. Accessories:

1. Operating handle lock.
2. Casing Guard: Aluminum.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

A. Identify required lines, levels, contours, and datum locations.

B. Verify that elevations of existing facilities prior to excavation and installation of non-freeze yard hydrants are as indicated on Drawings.

### 3.02 PREPARATION

A. Locate, identify, and protect from damage utilities to remain.

B. Do not interrupt existing utilities without permission and without making arrangements to provide temporary utility services.

1. Notify Architect/Engineer not less than three days in advance of proposed utility interruption.
2. Do not proceed without written permission from Architect/Engineer.

3.03 INSTALLATION OF NON-FREEZE YARD HYDRANTS

A. Perform trench excavation, backfilling, and compaction.

B. Install non-freeze yard hydrants in conjunction with pipe laying.

C. Provide support blocking and drainage gravel while installing non-freeze yard hydrants; do not block drain hole.

1. Orientation:

a. Set valves and hydrants plumb.
b. Set non-freeze yard hydrants with outlets as indicated on Drawings.

D. After main-line pressure testing, flush non-freeze yard hydrants and check for proper drainage.

E. Disinfection of Water Piping System: Flush and disinfect non-freeze yard hydrants with water mains as specified in Section 33 01 10.58 "Disinfection of Water Utility Piping Systems.

3.04 FIELD QUALITY CONTROL

A. Testing: Pressure test non-freeze yard hydrants with water mains.

B. Prepare test and inspection reports.

END OF SECTION